AUG 13 1927

Vol. 25. No. 8 AUGUST, 1927

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

AUG 15 1927

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1889.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN ST., NEW YORK, U. S. A.

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EVIDENCE
without adjectives

WE feel that these photos speak for themselves and do not require that we aim any adjectives at them.

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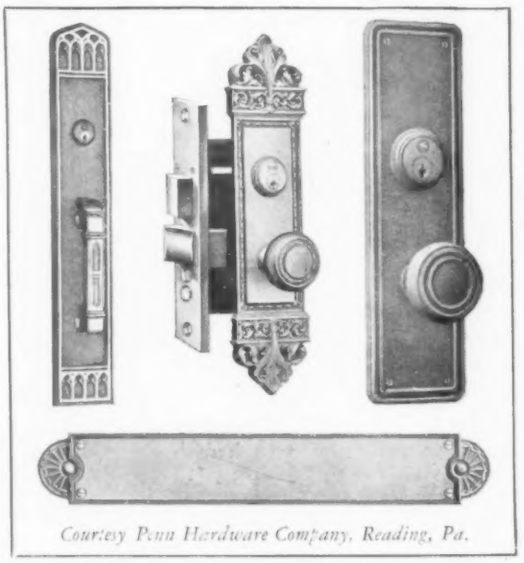

Courtesy Penn Hardware Company, Reading, Pa.

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Vol. 25 NEW YORK, AUGUST, 1927 No. 8

Brass Forging

Methods of Manufacturing Brass Forgings and Their Advantages Over Castings

Written for The Metal Industry by O. J. BERGER, Harvey Metal Corporation, Chicago, Ill.

Brass forgings have replaced brass castings in many lines where competition is keen and exacting. Brass forgings will be found in electric refrigeration units, auto hardware, ice box hardware, oil, steam, gas and gasoline fittings and valves, radio parts, carburetor parts, plumbing supplies, gas, steam and oil pumps, electrical units and a large number of other mechanical devices.

It is my opinion that the day is fast approaching when brass foundry production will be limited to castings having complicated core work, experimental lots for tryouts, compositions that cannot be forged, and to small quantities that will not justify a forging die cost. To back up my prediction, permit me to offer my own field experience. Since March 28th, 1926, I have taken orders for 4,166,500 forgings and to date not a single item has gone back to castings.

FORGINGS VS. CASTINGS

When one considers the following advantages of brass forgings over brass castings it is easy to appreciate the rapid progress being made by brass forging companies.

	FORGINGS	BRASS CASTINGS
Composition	S. A. E. 88 specification, 58½ to 61½% copper, 1½ to 2½% lead. Remainder zinc.	Varies more and according to grade of scrap added.
Scrap metal	None used; made of virgin metal only. Sometimes you add your own forging trim, but never miscellaneous scrap.	Generally used with its composition, perhaps unknown.
Strength	50,000 lbs. tensile strength.	20,000 to 30,000 lbs. tensile strength.
Cleanliness	Clean and perfect to shape. You can bright dip a forging in thirty seconds that will look cleaner than a casting tumbled and washed for years.	Necessary to tumble, sometimes for hours to remove sand. Tumbling may bend and change casting's shape.
Accuracy	Within plus or minus .005" in thickness. Metal dies control shape.	Varies considerably more in thickness. Casting shape depends on amount of rapping moulder gives pattern to get it out of sand, plus the distortion tumbling causes.
Porosity	None found. Machined forgings never tested for leaks.	Castings sometimes leak before machining, and oftentimes after machining.
Finish	As smooth as its metal die.	Varies with grade of sand used and care used in tumbling.
Tooling	Less costly tools are required due to accuracy of forgings in shape and dimensions. Life of tools is much longer.	Tools cost more because castings are distorted and vary more in shape and size. Sand in castings grinds down life of tools.
Machining	Free and easy because you are always working with virgin metal.	Varies with composition of castings plus hard spots and amount of sand found.
Surface	Oftentimes not necessary to machine. If machined, less finish is allowed.	Surface is rough and uneven and more is allowed for a machine cut.
Plated	Density of brass forgings gives the finest of finish.	More labor is required to prepare a casting for a finish. A great many times it is impossible to remove all the casting defects, hence the poor-looking finished castings.
Weight	Can reduce forging sections one third and still retain casting strength.	Varies unless casting is finished all over. When made heavier to gain strength you increase your cost.
Output	Production is greater, due to forgings being more uniform in size and easier to machine.	Varies with grade of castings, amount of sand and number of defects found after machining.
Cost	Forgings plus machining give a uniform cost.	Castings plus machining minus defects found after machining give a variable cost.
Employees	No dangerous fumes or dust to interfere with workman's ability, hence more uniform results.	Fumes and dirt we know affect employees, and have a direct bearing upon the uniform quality of castings produced.

TEMPERATURE VARIATION

By taking the benefit of the slight variation in mixture

permissible under the SAE-88 specification, plus the fact that brass, like steel, improves in hammering, this SAE-88 composition is adaptable for the replacement of nearly all the varying brass casting compositions.

The best of steel can be ruined by hitting it one blow after it has lost its forging temperature. When forging brass you have less range of temperature to work with than when forging steel. Brass can, however, be forged above or below its proper forging temperature and will pass any required test except a shock or sudden blow. It is for this reason that steam hammers with their short and quick blows will produce shell proof forgings.

It is the writer's opinion that brass forging equipment of the future will work brass several times faster than at the present time. With this desired speed we will have less die upkeep and will produce more complicated forgings with greater ease than anyone thinks possible today.

HOW BRASS FORGINGS ARE MADE

I have selected three examples to show different methods of forging brass. The armature driven end shows a hot press operation; the hood latch handle is an upsetter forging and the inside door handle is a steam hammer forging.

Fig. 1 shows how armature driven end die is made. This is an electrical unit part—a magneto driven end.

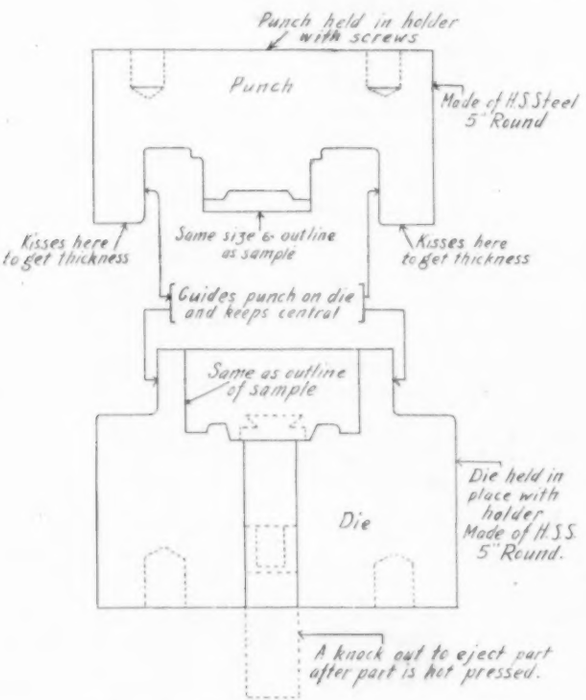
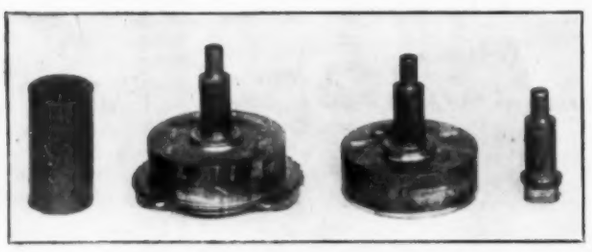

Punch held in holder with screws
Punch
Made of H.S Steel 5" Round
Kisses here to get thickness
Same size & outline as sample
Kisses here to get thickness
Guides punch on die and keeps central
Same as outline of sample
Die
Die held in place with holder Made of H.S.S. 5" Round.
A knock out to eject part after part is hot pressed.

FIG. 1. DIE FOR ARMATURE DRIVEN END

Slugs are cut to the length of the sample shown in Fig. 2. Insert is dropped into die, the heated slug is set on top of insert and hot pressed into place. This method of inserted steel into brass sections works very satisfactorily.



SLUG BEFORE TRIMMING AFTER TRIMMING STUD
FIGS. 2-5. STAGES OF AN ARMATURE DRIVEN END

Afterward the flash is trimmed off of the outside diameter section. Die for trimming is made the same as a washer die without a stripper. The punch shoves the forging through the die, thus cutting off the flash.

Fig. 6 shows how the hood latch upsetter die is made. The hood latch is made on the upsetter in one operation.

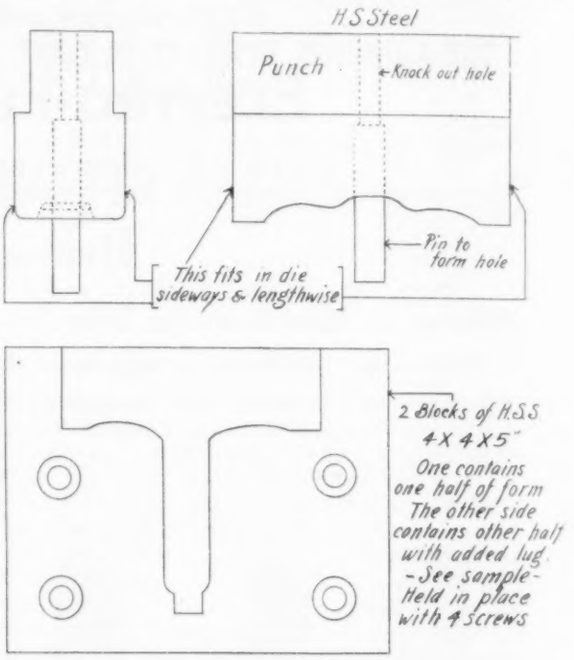
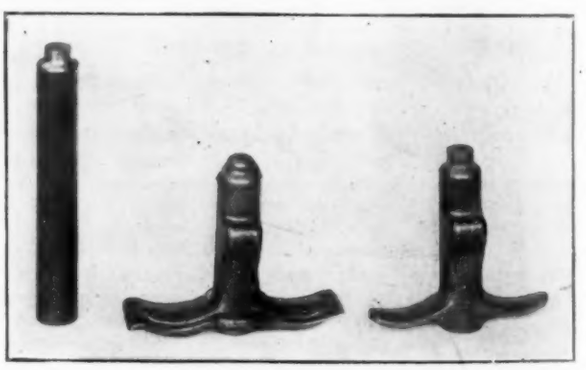

H.S Steel
Punch
Knock out hole
Pin to form hole
This fits in die sideways & lengthwise
2 Blocks of H.S.S 4 X 4 X 5"
One contains one half of form
The other side contains other half with added lug.
-See sample-
Held in place with 4 screws

FIG. 6. DIE FOR HOOD LATCH

The slug is cut off as shown in Fig. 7. It is heated to 1150° F. and placed in a die and upset.



SLUG BEFORE TRIMMING AFTER TRIMMING
FIGS. 7-9. STAGES OF A HOOD LATCH

The flash or scrap we get off this part is less than the percentage of loss going up a flue when melting brass for a piece of this weight. Our flash amounts to less than 25 lbs. per thousand pieces.

This forging gives strength in its thin side walls and a uniform and smooth forging requiring a minimum amount of hand labor to make it a richer looking finished handle than any casting ever poured.

Fig. 10 shows an inside door handle which is forged under a four-hundred-pound steam hammer. It is forged off the bar from 11/16" round brass. It is rolled three times on edger, then blocked and finished in the finish impression with one blow. It is cut off on the right hand side, back end of die.

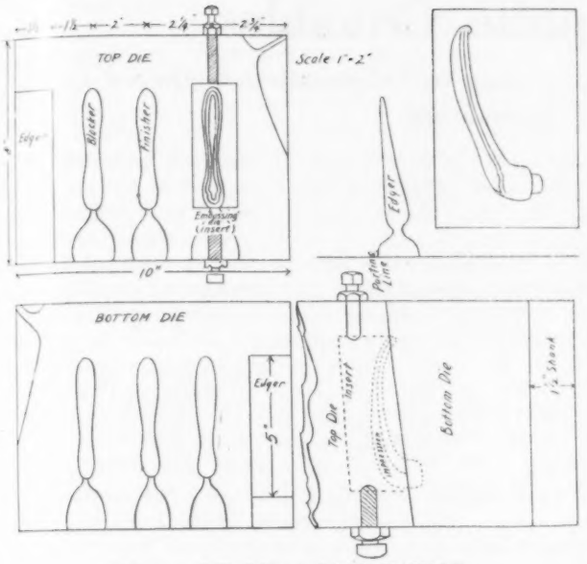


FIG. 10. DIE FOR A DOOR HANDLE

After flash has been removed (this part is tumbled in sand to remove the flash line) it is put back in the die and the fancy design is forged into the handle. This is the last forging operation.

FIG. 11. BEFORE TRIMMING FIG. 12. AFTER TRIMMING

If this handle were cast the engraving would have to be polished off a large part of the castings, due to the number of sand holes and defects to be removed to get a good finish on the handle.

With a forging you save at least one half of the polishing cost, since only a thin skin need be removed to get the finish desired. The fancy design is uniform in design and depth.

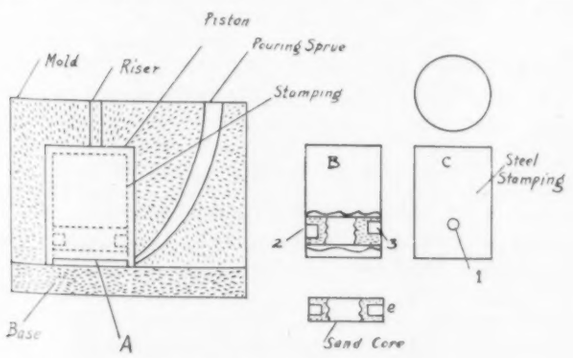
Making Aluminum Pistons in Composition Molds

By EDWARD D. GLEASON

Aluminum pistons as in vogue today are made in cast iron molds with collapsible metal cases with a wedge in the center. After the mold is poured this wedge is removed by prying with a bar and removing two pieces which form the interior of the piston. Two round pins which forms the core in the hubs are quickly removed and the piston is removed after opening the mold; all of which has to be done very rapidly or the metal will freeze to the metal cores. The person operating one of these molds has to move rapidly to make 600 pistons a day. Where steel or cast iron molds are used to make aluminum castings they are coated with diluted silicate of soda and kaolin and sprayed on the mold with an atomizer while the mold is hot, as this prevents the mold from being attacked by the hot aluminum and prevents sticking.

A better method and a better piston resulting in from 2,500 to 3,000 castings a day can be made as follows:

The drawings show one half of a mold made of silica



MOLD FOR ALUMINUM PISTON

sand, clay and cement (6 parts of silica flour, 4 parts powdered high temperature cement, and 1 part portland cement, mixed thoroughly). "A" is a round hub, in the center of the mold in the supporting base. B. and C. are light gauge steel stamping with openings 1, 2, 3. C. is a sand core and this sand core is shown in place in B. the opening in the core forming the hub and being centered with the openings in the steel stamping. The stamping is shown in place in the mold by dotted lines, being centered by the round hub A. in which it sets. When the two halves of the mold are closed it functions as follows. Metal is poured which will fill up the mold running through the openings 1, 2, and 3, into the sand core and into the space forming the walls of the piston. The metal will freeze and shrink into the steel stamping making a reinforced piston, the casting is then removed from the mold, the sand core destroyed and the piston is completed.

A battery of 100 of these molds can be cheaply made and 100 of them can be poured by ordinary labor in less than one hour and any one operating these molds will not be nearly as fatigued as if he were operating a metal mold.

Likewise cooking utensils such as coffee and tea pots can be made. Green sand cores can be rapidly made in a core machine which will take the place of the stamping shown.

Drop Hammer Alloy

By W. J. REARDON

Q.—Will you kindly advise us what mixture of lead, etc., is practical to make a force to be used as a male die for drop hammer use. We have used a lead mixture of about 10% antimony and 3% tin and the balance lead but find it is too brittle for this work.

A.—We suggest you use bronze to cast a male die for drop hammer work. However, if you want a soft low-melting point metal such as you have been using we suggest 83⅓ tin, 8⅓ antimony and 8⅓ copper. This metal will stand hammering and will not get brittle. If you desire a cheaper mixture, one not as good as No. 1, we suggest 10 tin, 15 antimony and 75 lead. This metal can be bought from any of the white metal concerns in ingot form all mixed and all that is required is to melt and pour at a low temperature for best results.

The Use of Graphite Crucibles

Graphite Crucibles Still in the Running, According to Information Gathered by the Plumbago Crucible Association

The graphite crucible manufacturers in the United States have noticed that in the leading article in an issue of another journal on the use of electricity in the modern foundry, there appears under a headline the statement that electricity is becoming almost universal in the non-ferrous field for melting purposes.

The graphite crucible manufacturers do not wish to deny the utility and usefulness of the electric furnace and recognize that in the march of progress in science and industry the electric furnace has come to play an important part. However they feel that exaggerated or perhaps unfounded statements such as are contained in the article previously referred to should be corrected and foundrymen should have placed before them the facts in the case which will not only show that graphite crucibles still continue to enjoy a large measure of usefulness in non-ferrous foundries but that the melting of metal in graphite crucibles and in furnaces of other types than the electric, actually appears to be increasing.

The source of the figures quoted at the conclusion of the above mentioned article, showing the number of electric furnaces in use in non-ferrous foundries, is not given but in the Iron Age under date of May 15, 1924, it was estimated that there were then 540 electric furnaces used in the non-ferrous metal industry, and in April of this year Dr. Gillett placed the number at 625.

CRUCIBLE STATISTICS

On the crucible side of the picture, the figures given below deserve serious attention because they have been collected by one of the oldest and most reliable foundry publications in the United States. According to the information supplied by this publication last year there were then a total of 3,575 non-ferrous foundries in the United States and Canada. They sent questionnaires to all of them and received replies from 2,214 concerns, which reported a total number of furnaces in use, of types other than the electric, as follows:

Crucible Furnaces	8,904
Non-Crucible Furnaces	1,504

Estimating that the foundries that did not reply used the various types of furnaces in the same ratio, this would given an estimated number of these types of furnaces in use in the non-ferrous melting industry of the two countries as follows:

Crucible Furnaces	14,371
Non-Crucible Furnaces	2,431

These figures apparently substantiate the claims of the crucible manufacturers that other types of melting than the electric are still in large use.

This can perhaps be better demonstrated by using the Government figures on sales of graphite crucibles for 1925 which is the latest report available, and for pre-war years, and which show sales of graphite crucibles to have been as follows:

1904	$1,343,000
1909	1,849,000
1914	1,886,000
1925	2,322,000

The 1925 figures, however, include the sale of $519,892 glass house pots and other refractories, this representing approximately 22% of the total sales for that year shown above. For 1923 the report of crucible sales put out by the United States Government included sales of these other products which amounted to more than 50% of the total Government figures. Unfortunately there are no records available to show what these outside products amounted to in the pre-war years, but assuming that they were no larger than the figures for 1925; namely, 22%, the comparison after deducting these outside products would be as follows:

	Total Crucible Sales
1904	$1,048,000
1909	1,442,000
1914	1,471,000
1925	1,802,000

The question of post-war price inflation enters here, of course. The pre-war prices of these crucibles ranged from 5 to 5½c per number and the 1925 and later years prices have ranged from 9 to 11c per number. Averaging the pre-war sales at 5c per number and the post-war sales at 10c per number would permit these figures to be placed on a comparable basis by showing sales in numbers as follows:

1904	20,960,000 numbers
1909	28,840,000 "
1914	29,420,000 "
1925	18,020,000 "

This shows a considerable decline in numbers of crucibles sold in later years but at this point there must be considered the progress and improvement that has been made in recent years in the manufacture of this product. It is no exaggeration to say that the average life of a graphite crucible today is twice as many heats as it was before the war. Prior to 1914 crucibles averaged from 20 to 25 heats each. Now it is not uncommon to hear of crucibles running up to 80 and 100 heats, and it would seem conservative to say that the present day average is from 40 to 60 heats per crucible.

Translating the numbers of crucibles sold into numbers of heats melted on the basis of 20 heats to a number in the pre-war period and 40 heats to a number in present day melting, and there would be shown the following comparison:

1904	419 million heats
1909	576 " "
1914	588 " "
1925	720 " "

In other words, more metal is being melted in crucibles today than was the case before the introduction of the electric furnace, and this despite the large scale melting operations that now are carried on electrically.

OPINIONS OF CRUCIBLE USERS

The crucible manufacturers have been conducting an advertising campaign for some time to feature the advantages of the crucible as an adjunct of non-ferrous metal melting and during the past year they have featured prominent concerns who have given their reasons for still using this old and time honored method of melting. Some of these are given below:

"For more than 90 years the Gorham Manufacturing Company have been America's leading silversmiths. Gorham are the largest manufacturers of sterling silverware in the world.

During all these 90 years Gorham have depended upon crucibles in melting silver because only crucibles will

produce the required uniformity and purity in metal."

"Throughout America the largest and finest homes, apartments, hotels and office buildings are equipped with flush valves made by the Sloan Valve Company, Chicago.

High quality, which is indicated by the choice of this Company's products for use in the structures mentioned, demands absolute uniformity and accurate control of metal mixtures. For this reason, the Sloan Valve Co., which has been in operation for more than twenty years, always melts its red brass, nickel mixtures and special alloys in crucibles."

"With its heritage of integrity, the Yale & Towne Manufacturing Company guards jealously the character of its brass and alloy castings. Only the highest quality will meet its self-imposed rigid requirements. Accordingly, a large portion of the seven or eight tons of non-ferrous metal melted each day is refined in crucibles. Coal fired pit furnaces give capacity for 96 crucibles to be employed simultaneously producing varied analyses, each distinct in its characteristics, if needed, to meet individual requirements. In addition, 27 oil-fired tilting crucible type furnaces of larger capacity are available."

"The Michigan Smelting & Refining Company operates thirty crucible pit-type, coke-fired furnaces for melting so-called yellow brass. The metal is melted in 600 pound crucibles and poured into ingots or billets. Manganese mixtures and various special alloys are also melted.

Among the outstanding advantages derived from crucible melting are:

Low melting cost. Low furnace maintenance. Fuel Economy. Flexibility.

When melting in crucibles no harmful agent comes in contact with the melted metal.

Lead base alloys are melted in crucibles with security against furnace or lining loss."

"The Federal-Mogul Corporation, over a period of many years, has found crucible melting economical in operation, maintenance and scrap loss, in addition to having exceptional flexibility. Crucibles assure metal of the highest quality."

"One of the most noted makers of bells in the United States is the McShane Bell Foundry Company, Inc., of Baltimore, Md., established in 1856.

In addition to its bell foundry, this Company also operates a foundry for the casting of brass plumbing supplies.

One of the outstanding advantages this Company has found in crucible melting is the control; another, minimizing shrinkage."

"For almost a half century, the Seymour Manufacturing Company has been noted for the uniformly high quality of its Nickel Silver.

Nickel Silver presents one of the most difficult problems, from the standpoint of melting, of any of the non-ferrous alloys.

Requiring as it does, temperatures exceeding 2250 deg. Fahr., and being sensitive to oxidation and slag inclusions, the container in which it is melted becomes all important.

The service is so severe that only the high standards maintained by producers of crucibles, both as to materials and methods of manufacture, make it possible to handle the melting of this important alloy without prohibitive expense."

"In 1925 the Bohn Aluminum & Brass Corporation poured eighteen million pounds of aluminum castings which found their way into automobiles of every well-known make.

It is the experience of this Company that crucible melting eliminates excessive contraction and produces a metal of greater tensile strength; also that speedy melting at a low melting and maintenance cost plus a low scrap loss is secured with crucibles. A considerable fuel saving likewise is effected because crucibles may be raised quickly to the proper melting heat. The Bohn plants melt more than twenty aluminum mixtures with a melting loss under 1 per cent."

"Aluminum castings made in the Packard foundries include crankshaft bearing caps, crankshaft bearing housings, camshaft lever housings, accelerator pedals, seat steps, toe plates, inclined front floor boards, crankcase and miscellaneous hardware.

The metal is melted in a battery of 11 oil-fired furnaces and is delivered and poured in graphite crucibles, which maintain the high temperature desired without offering contamination to the metal."

"The Reading Hardware Corporation operates a modern foundry and employs the most efficient methods to insure the high quality work necessary in the production of its large and diversified line of products. By crucible melting its metal, of which there are six mixes, the Reading Hardware Corporation secures the greatest possible metal control and flexibility in handling at a minimum melting cost."

"An experience gained over nearly three score years of continuous melting of non-ferrous alloys, has made the Hills-McCanna Company an enthusiastic indorser of graphite crucible melting. During all these years they have found no other method to equal it for their purposes.

Graphite crucible melting enables the Hills-McCanna Company to maintain careful supervision throughout the entire melting process thereby obtaining absolute uniformity of metal. Oxidation and slag are minimized and fuel cost is low."

"After thoroughly testing out all modern methods of melting, the American Manganese Bronze Company adopted graphite crucible melting in oil fired furnaces as standard because this method was found to be the most economical, the most flexible and at the same time permitting the greatest accuracy of control in alloying. The latter feature was of extreme importance because in nearly all metals produced accuracy in the composition and high tests are outstanding essentials."

As previously stated, this is not an attempt to disparage the electric furnace but it is an appeal to foundrymen to weigh the merits of other forms of melting carefully before making a change.

A careful survey has been made of results being obtained in a number of modern foundries using oil-fired crucible furnaces of an up-to-date type and below is shown an example of melting costs for such a furnace, which has been pronounced by several authorities as approximating actual results obtained and which it is believed compares favorably with any other type of melting.

MELTING COSTS WITH A MODERN TYPE OIL-FIRED CRUCIBLE FURNACE

Example—Oil fired stationary crucible furnace—No. 70 crucible size.

Crucible Cost

Price taken at $0.10 per number, service taken at 50 heats average (a conservative average for this type of furnace).

50 heats at 210 lbs. per heat or 10,500 lbs.

Cost of crucible $7.00.

7.00/10500 x 2000 or $1.33 per ton.

Fuel Cost

2 gal. oil per cwt. or 40 gal. per ton at $0.08 per gal. or $3.20 per ton.

Lining Cost

Conservative figure of $45.00 per lining, including maintenance.

Average life six months or 150 service days, at 9 heats per day or 1350 heats.
1350 heats at 210 lbs. per heat or 142 tons.
$45.00 divided by 142 or $0.32 per ton.

Labor Cost

$8.10 per day for five furnaces. (Figures taken from actual practice.)
$8.10/5 or $1.62 per day per furnace.
At 9 heats of 210 lbs. each, one furnace will produce 1890 lbs. per day.
$1.62/1890 x 2000 or $1.71 per ton.

Interest and Depreciation

6% for interest
6% for repairs
+ 10% for depreciation = 22%

Original cost $350.00.
22% x $350.00 or $77.00 per year.
Per day—7700/300 or $.256 per day.
.256/1890 x 2000 or $.27 per ton.

Summary

Crucible cost	$1.33
Fuel cost	3.20
Lining cost	.32
Labor cost	1.71
Int. & Dep. cost	.27
	$6.83

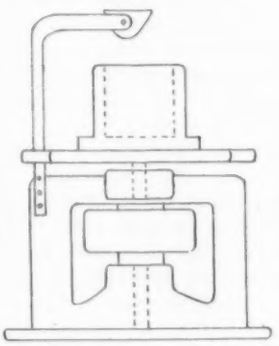
Cost of melting.

Centrifugal Casting of Bearings

By W. J. Reardon

Q.—One of our customers has asked us for information regarding the centrifugal method of babbitting bearings. Can you give us some information on this subject? If you know of any concerns who manufacture machines to do this work, we would also appreciate that information.

A.—We do not know of anyone manufacturing centrifugal machine for babbitting bearings. However, some manufacturers use this method and design their own machines to suit their requirements. The exact amount of metal is dipped in the ladle which has been figured out to contain the desired amount of metal and poured in while the mold is revolving at the speed desired to obtain the results required. It is not much of a trick to design a mold for centrifugal method of babbitting bearings with a little experimenting.



FIXTURE TO CAST BEARING CENTRIFUGAL

Refining Scrap

By W. J. Reardon

Q.—Under the heading "Casting Problems" in the April issue of the Metal Industry, we note that you recommend the use of raw potatoes as a means of boiling out the oxides and other inclusions in lead alloys.

We have done quite a little experimental work along these lines and are now using yellow pine box scrap, which is of course quite green and, therefore, contains a considerable amount of moisture and has a rather high rosin and turpentine content.

The writer would be very much interested to have your opinion as to the relative merits of these two methods of purifying white metal alloys.

A.—We believe your method of purifying white metal by using green yellow pine to be just as good as raw potatoes. However, there is some objection to the smoke from the wood, but the results would be the same.

The idea is that the moisture that is contained in the wood or potato is emitted in the form of steam which causes continuous boiling and eliminates the oxides. Very often green hickory poles are used for the same purpose both in refining white metals and copper. The relative merits of either is a matter of choice. Both processes obtain the same results.

Protecting Iron Pots

By W. J. Reardon

Q.—Could you tell me what to use for coating (painting) the inside of a cast iron pot used to melt lead-antimony alloys; especially desired when using zinc base alloys as I believe the zinc and iron together injure the zinc alloy.

I imagine it would be in the ceramic line, perhaps a thin solution of fireclay. However, I would like to know of something that someone else is using, that will stay on pretty well.

A.—We do not know of anything to use as a coating on a cast iron pot used for melting zinc that would be permanent. However, you can help the life of the pot by using a mixture of clay mixed with water containing sodium silicate to a creamy consistency. Paint on the inside of the pot and allow to dry slowly. This will protect the pot somewhat. It is recommended, however, that the inside of the pot be scraped thoroughly after each heat and do not let any metal remain in pot to cool. Pour out in ingots all metal each day.

The best results the writer has ever seen from a cast iron pot for melting zinc is one containing approximately 5% nickel in the iron mixture. Use a low phosphorus iron and the silicon 2 to 3%. This mixture of iron has also been found very good for the plungers in die casting machines.

A Screw Head Everlasting

Nowadays much is written about the everlasting properties of the non-ferrous metals and alloys and the archeologist is continually stumbling on metals which have outlasted their time, while iron and steel have gone to the scrap heap or rust pile.

A case in point discovered last month at the famous summer resort of Kineo on Moosehead Lake, State of Maine, was the brass screwhead and what is left of the iron screw shown in cut. In making repairs in the bathroom of the camp, occupied by Jack McEntee Bowman, the prominent hotel proprietor and manager, the workmen in shifting the position of the bowl, found that the lag screws holding the bowl base to the floor had rusted nearly to nothing after twenty-five years of service, while the brass cap of the screw was as sound and strong as ever and had accumulated a fine coat of verde antique.

BRASS (left) vs. IRON (right)

The moral is, if bathroom fixtures and fastenings are to outlast a generation, they must be made of the everlasting metals or alloys, copper, brass, bronze or the others on the list.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 11

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

DRY VS. GREEN SAND

At this point the dividing line between the dry and the green sand mold might be considered. This line is often an item of indecision and molders and foundry foreman frequently hesitate between the two methods of molding certain castings. For this reason different foundries making the same casting mold differently, the one by the green the other by the dry method. In all cases the safe rule is, when in doubt resort to the dry mold which is always the safer. These conditions vary widely among different foundries and in no two can they be said to be exactly the same. One foundry may mold a certain casting green and lose it whereas another foundry by virtue of better molding, better equipment, more suitable sand, wider experience etc. may succeed admirably by the same method. Green molding is far more treacherous than dry molding, but it is faster and cheaper.

The main determining factor between green and dry molding and casting is the power of green sand in its natural state to maintain its resistance against the action of liquid metal and to pass off freely through its pores those gases generated by the metal in the sand. In this green and natural state any grade of sand will continue this resistance up to a certain point and then collapse under so much heat, so much impact and erosion, so much pressure, etc. Its bond burns out, its steam and other gases generate beyond the capacities of their escaping avenues, its strength fails under continued impact of flowing metal or under the increasing pressure of static metal and the powers against it are bound to prevail. It is safely on this side of the collapsing point that the distinction between the green and the dry mold should be made. Before making the distinction however, steps can often be taken from a standpoint of principle to make the green sand mold otherwise safer. The green mold gives trouble principally under the following conditions.

First. When the volume or body of metal is so large as to generate violently, steam and other mold gases in the sand before the mold is filled or before a metal crust has formed entirely around the casing. These gases then get to the liquid metal, setting up an agitation that results in the partial or complete destruction of the mold. If any average mold were "steaming" while pouring as freely as a few minutes after pouring, it would never pour. In green molds of larger volume this is practically the condition that prevails before the metal starts to set and the dry mold becomes practically imperative.

To extend the green mold possibilities beyond the average, the sand (especially the background sand) should be of the open grade, thoroughly vented and used in as "dry-green" state as possible. A very thin veneer of finer sand against the pattern if judiciously selected and applied can be used to improve the casting surface appearance. A further and very valuable possibility is the use of a compound facing in dry-green state as a veneer around the pattern. This facing should be made of a fairly open sand to which some bond such as flour or other compound should be added in about one to forty rates. The facing should be thoroughly mixed, sieved on the floor and applied in rather dry-green condition to about one-half inch thickness around the pattern. The metal engaging the surface bakes it to a thin bonded crust peculiarly impervious and resistant to gases and metal action. It practically makes the mold a self-manipulating, skin-dried mold and is one of the author's very successful methods of green-molding castings that approximate the danger line of the green sand molding. In resorting to this method, however, care must be taken not to have the facing very wet, or of great depth from the pattern backwards, and to use a good grade of the open sand well vented back of the facing.

Regarding venting it might be well to point out here that the vent wire creates only a main avenue of escape and that to reach these main avenues gases must depend upon the permeability of the sand. Obviously the more judiciously these main avenues are placed the better the chances of the gases to get to them. The limit of all precaution, however, is that bulk of metal that will generate more gases in the mold than the sand will pass off before the metal starts to set, and at this point the dry mold becomes the logical consideration.

Second. When the cores are of such nature that their setting and retaining are beyond the power of green sand to permit. Many such cases arise. In some, the dry mold is the only alternative. In others dry sand print cores can often be used either as a ram-up core or a core accounted for in the print of the core.

Another possibility often open is the use of metal guides to set the core by. These guides can be of metal plates or strips and can be rammed up in the mold bearing against the core print on the pattern. In setting a core or in stacking a series of cores blindly into a deep mold these metal strip guides are often quite applicable. In a round core for instance three points and consequently three metal strips will determine the position. In cores of the other shapes, two or three or four strips may be required. Incidently dry sand slab cores will often serve the same purpose. Often an ordinary iron washer can be slipped over a round core print, rammed up with the mold and made the guiding medium in setting a core where vision is shut off. A dry slab core with a hole drilled in it will do the same thing.

Sometimes a core print is too short or a core is too heavy for green sand to support. Iron strips or plates running from the core print to the bottom board or laid cross-wise over the prints will supply the needed strength. Barring the flask over the print is another measure. Examples might be multiplied indefinitely of instances where simple mechanical means can be applied to the setting and retaining of cores permitting a green mold where a dry mold might otherwise be required.

This series will be continued in an early issue.—Ed.

*All rights reserved. This series will be collected and published in book form. Parts 1 to 10, inclusive, were published in our issues of July, August, September, October, November, 1926. January, February, March, April and May, 1927.

The Design and Workmanship of Drinking Horns

This Is the First of a Series on the Drinking Vessels of Olden Times

Written for The Metal Industry by A. F. SAUNDERS, Designer, Benedict Manufacturing Company

Drinking vessels are as ancient as drinking itself and the earliest forms of cups were derived from both the vegetable and animal kingdoms. Gourds, the shells of nuts and the horns of animals were natural forms which lent themselves readily to the purpose. The primeval custom of using the horns of animals as drinking vessels, undoubtedly one of the very earliest forms of cup used by man, found great favor in England and the Northern countries during the middle ages. This style of drinking vessel reached its highest form of artistic development during the Renaissance, as the artistry and skill of the very best craftsmen of the 15th and 16th centuries was lavished upon the mountings of these unique vessels.

Most of the ancient Athenian cups were made from horns, beautifully carved with borders and scrolls and the savage Gaul, too, was in the habit of removing the horns from the wild ox he had slain, adorning them with bands of gold or silver and setting them before his guests at table. Caesar in his history of the Gallic wars, mentions the use of these metal mounted horns and emphasizes the fact that they were the principal form of drinking cup used by the Germanic tribes at their feasts.

We should remember that in ancient times drinking customs were invested with more or less elaborate ceremony. The cup bearer and toast master had important and solemn functions to perform and the master of the feast and his guests followed certain rites in their potations. Thus we find it was quite usual to dedicate special vessels for such purposes, a custom which brought about the development of an infinite variety of styles and nowhere is the influence of caprice and heedless confusion of forms more conspicuous than in this class of vessels.

However, if we disregard freaks and those anomalous forms of drinking vessels which have been evolved more by the influence of fashion and caprice than by intended use, the group resolves itself into a few fundamental forms, most of which, in the beginning, were made possible by the invention of the potter's wheel, but of the purely natural forms the drinking horn is perhaps one of the best examples of man's adaptation of natural forms to his uses, and for several centuries it enjoyed great favor as the principal vessel from which the toasts were drunk around the festive board.

A unique and picturesque variation of the drinking horn is found in the antique "Rhyton," a peculiar vessel developed by the Greeks whose finer nature always rebelled against the barbarous custom of drinking out of animals' horns. This vessel was made in two distinct styles, both fundamentally based on the same general idea. The more refined form had a curved body in the

FIG. 1. GRAECO-PERSIAN DRINKING HORN OF SILVER IN THE LOUVRE, PARIS

FIG. 2. EARLY GREEK RHYTON (TRAGELAPHOS) IN THE FORM OF A RAM'S HEAD IN THE MUSEUM OF FINE ARTS, BOSTON

FIG. 3. ANTIQUE GREEK DRINKING HORN OF BRONZE

FIG. 4. EARLY GREEK RHYTON (GRYPS) IN THE FORM OF A VULTURE'S HEAD

FIG. 5. ANTIQUE STATE RHYTON, IN VATICAN MUSEUM, ROME

FIG. 6. MIDDLE 17TH CENTURY DANISH DRINKING HORN OF SOLID GOLD

shape of a horn and ending in a point with some kind of animal's head, the whole supported by a low base or foot. The simpler and perhaps earlier type was that of an animal's head ending in a flared neck at the top and provided with a simple handle on the side. When filled this vessel could not be set down until its contents had been consumed and it was customary at the great drinking bouts of ancient times to empty, at the command of the toastmaster, the Rhyton at one draught. Occasionally the vessel was provided with a small opening at the extreme point through which the wine could be drunk in a delicate stream as often shown in rare antique Greek paintings.

The Rhyton bore special names according to the character of the motif used. Thus, there were the Elaphos, with a stag head, the Capros, a swine head, the Tragelaphos, a ram's head, the Onos, the head of an ass, and the Gryps, the vulture's head. Sometimes a human head was used as a model. Figs. 1 and 2, Plate 1 illustrate the two styles of this antique drinking vessel.

The old drinking horns varied greatly in size and elegance of the mountings. Horns of the ruminant animals were used, principally those of the wild ox, the wild goat and of domestic cattle. Sometimes the ivory tusk of the elephant also the spiral horn of the narwhale (a marine mammal), were mounted in this fashion. The horn of the narwhale being straight in form was used as the body of the cup as illustrated in Fig. 10, Plate 2. Perhaps a word about the preparation of the horn will not be amiss, as much of the beauty of these vessels depends upon the color and texture of the horn itself. The natural horn was hollowed out and carefully polished to the highest possible degree of perfection, which brought out the beauty of both color and texture of the horn. The outer surface was often carved in low relief or simple tracery and the decorative design usually included an appropriate inscription. The horn was then ready for its metal mountings which ranged from the simplest of silver rings encircling the horn at intervals to the most elaborate supporting frames of chased work in silver and gold. Some drinking horns of Mediaeval craftsmanship were mounted in pure gold encrusted with precious gems or set with beautifully enameled plaques.

The huge 15th Century horn shown as Fig. 8, Plate 2, is one of the largest and finest of its kind ever mounted in the precious metals. This horn, or rather elephant's tusk, measures over 30 inches in length and is probably intended as a superb show piece rather than for actual use as a drinking vessel. The artistic feeling displayed in its design, which is a unique blending of the Gothic with the oriental, combined with exquisite craftsmanship in the making, distinguishes this piece as an unusually fine example of the silversmith's art. The elaborately carved and mounted tusk rests upon two Gothic towers of most pleasing architectural design and borne aloft upon the sturdy backs of two elephants. Within the towers are small figures of oriental warriors, and

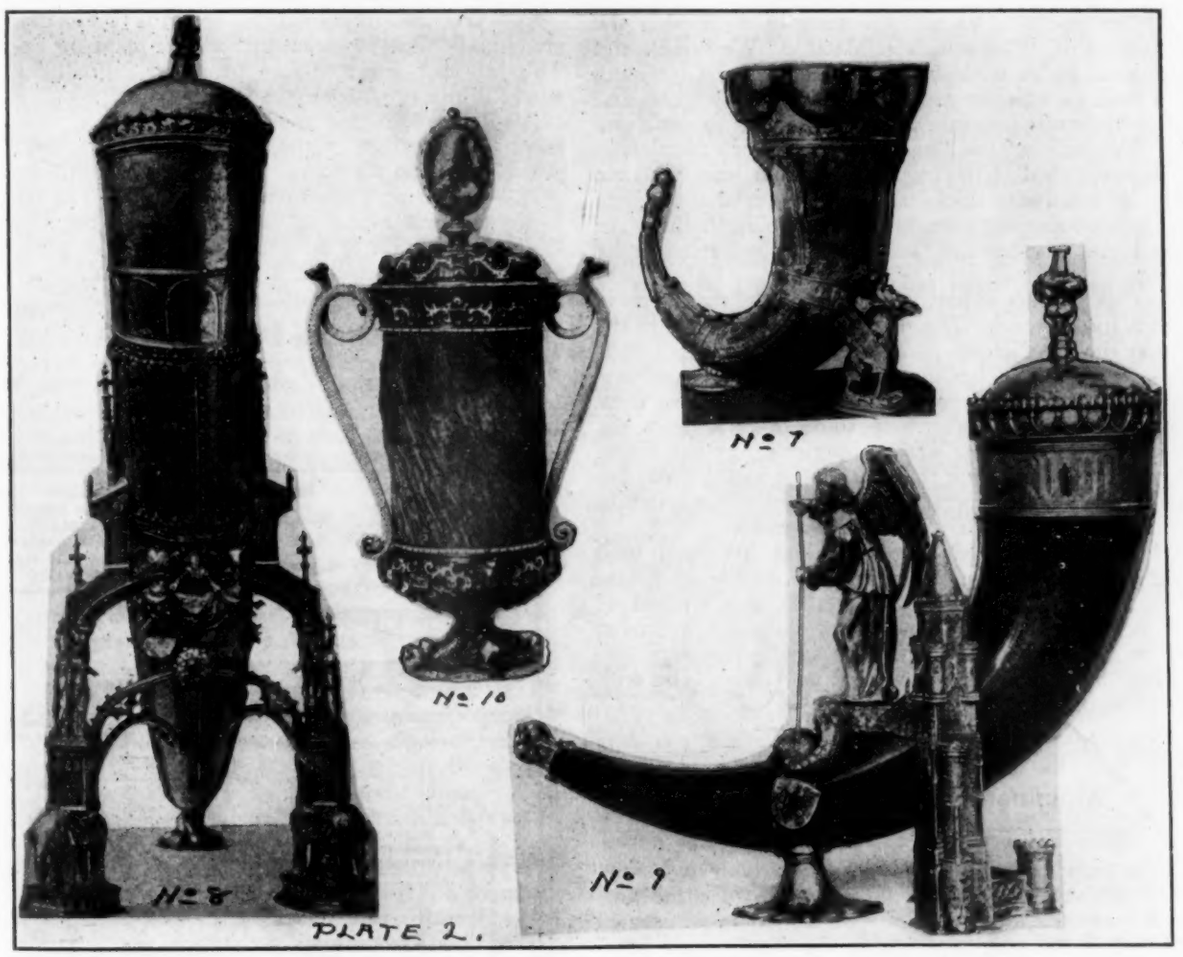


FIG. 7. 15TH CENTURY DRINKING HORN MOUNTED IN SILVER GILT OF GERMAN WORKMANSHIP

FIG. 8. ELABORATE SILVER MOUNTED ELEPHANT TUSK, 15TH CENTURY

FIG. 9. SILVER MOUNTED DRINKING HORN OF 15TH CENTURY GERMAN WORKMANSHIP

FIG. 10. CUP OF NARWHALE HORN MOUNTED IN GOLD AND ENAMEL, 16TH CENTURY, AUSTRIAN WORKMANSHIP

on the front of the main arch supporting the center of the tusk appears a beautifully modeled and chased figure of an angel supporting two armorial shields enameled in color. The body mounting consists of a broad ring at the mouth, a similar narrow ring in the middle and a complete covering point terminating in a richly developed finial. These parts are edged by delicately chased bands of Gothic foliage and connected with one another. The broad upper ring contains ten arcs in which the ribs of the horn end, delicately carved tracery with flowers and birds cover the exposed ivory surface of the upper sections of the tusk. The date of its making, 1486, also appears.

The horn is fitted with an oval metal lid embellished in a similar manner and topped with a beautifully chased Gothic finial. The cover is also fitted with an inside screw so that it can be screwed on the finial at the end of the small end of the horn when used for drinking. The entire mounting and supporting frame of this horn is of silver gilt, of German workmanship.

The smaller and simpler, though equally artistic drinking horn of the same period shown as Fig 7, Plate 2 is another example of German craftsmanship of the highest order. The horn of a wild ox is embellished with a rich setting of silver gilt of chased design and with a boldly bossed edge. The fore part of the horn rests on a winged griffin and the small curved end of the horn is decorated with a finely chased cap and knob finial. Four centuries of time has softened the coloring of the natural horn to a most beautiful blending of various shades of brown, and the rich silver gilt mounting has acquired the soft mellow tone that time only can give to the precious metals.

There are but comparatively few of these fine old drinking horns in existence now, as the mountings of precious metal of many an old horn, along with other priceless art treasurers of mediaeval craftsmanship found their way into the melting pot to help satisfy the demon God, War. Among the finest of old horns to be found, outside of private collections, are those owned by the Museum of Industrial Art in Berlin, the Art-History Museum at Vienna and the Victoria and Albert Museum of London.

The next article of the series will describe the shallow dish type of cup, perfected during the best period of Greek Art, in the Kylix, truly the most beautifully proportioned drinking vessel conceived by man.

Platinum Top Metal

By Jewelry Metallurgist

Q.—Can you give us any information concerning the manufacture of "Platinum Top Metal"? We understand this product to be a combination of a sheet of platinum with a sheet of white or green gold, united under heat and perhaps hydraulic pressure in such a way as to form one piece. We believe that the union of the two metals has been accomplished in the ingot form, or at least with the metals in relatively thick plates, the combination then being reduced to sheet form in ordinary rolling mills. We do not know whether they are united by soldering or by welding.

A.—This product is hard to make and the manufacture is kept a trade secret. The difficulty resides partly in the fact that the co-efficients of expansion of the two metals are so different that buckling occurs when the combination cools. Yes, the metals are joined while in the form of relatively thick bars, and in some cases at least the job is done with solder and a jeweler's oxy-gas torch. The product is the same in principle as rolled gold, but in this case the two metals are sufficiently dissimilar to make the process much more troublesome.

It has been reported that a method has been used similar to that for the production of ductile tungsten: that is, the two bars, fastened together with a sheet of solder between, are heated in an atmosphere of hydrogen or other non-oxidizing gas, then swaged while very hot. Whether this is true or not we do not know. The difficulties are obvious.

Aluminum Protects Duralumin

Recent tests have been made by the Bureau of Standards, Washington, D. C., to find methods of protecting aircraft from salt air corrosion. So far aluminum-coated duralumin is the only preparation that has proved satisfactory. The coating is effected by spraying pure aluminum on the alloy. It will stand scratching and does not crack or blister.

Lubricant for Aluminum

By P. W. Blair

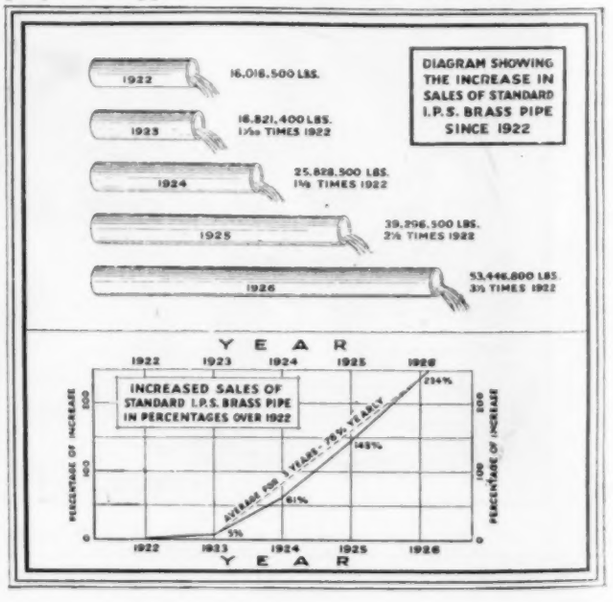
Q.—We are interested in securing a lubricant for aluminum to use in connection with a blanking operation. This lubricant must be free from any ingredients which would injure or discolor the aluminum.

Also, the lubricant must evaporate in a short time, leaving the surface of the article clean, as it will be impossible to clean the parts after they are manufactured.

A.—Try using gasoline as a lubricant. The body will be light, it will evaporate and not discolor the aluminum. With the addition of a certain percentage of glycerine to give body to the gasoline, it may be practical.

Brass Pipe Sales

Below is a diagram illustrating the increase in the sales of brass pipe from 1922 to 1926. This diagram was made up by the Copper & Brass Research Association.



Chromium Plating Developments

Recent Advances in the Commercial Electrodeposition of Chromium. From the Monthly Review of the American Electro-Platers' Society.

By CHARLES H. PROCTOR

It is the intention of the author of this paper to present to his readers the basic factors that have established prior art in the electrodeposition of the metal chromium by American investigators for Americans, and for the American metal fabricating industry, as a whole, in the United States, uncontrolled by any existing patent or patents, whether granted in this country or any European country, which presumes to control prior art so established and create a monpoly of one of the most important developments in the electrodeposition of metals in nearly a century.

While it is true that the early investigators in the electrodeposition of chromium was made by foreign investigators, first by Bunsen in 1854 and later by Geuther in 1856, who presumably first undertook the electrolysis of chromic acid and weighed the chromium which he obtained from its solution; following Geuther's experiments and the theoretical views expressed by him, Buff in 1857 undertook the electrolysis of chromic acid. Buff was unsuccessful in obtaining a deposit of metallic chromium. He therefore claimed that the results of Guether were unreliable.

Geuther, however, in the light of recent developments in America by Americans in the commercial metal fabricating industry, was absolutely correct in his statements. When I state to you absolutely that chromium is now being deposited from chromic acid solutions exclusively, having a cromic acid content of fifty ounces per gallon of water, it is not so much the composition of the solution but its control that insures commercial results.

In 1894 Placet and Bonnet were granted an American patent No. 526,114, September, 1894, the specifications of which are in all probability more complete than those of their earlier European patents.

They state that of the electrolytes which they use the most important of these compounds is chromic acid, either the commercial acid or a cromic acid obtained from chromate or bichromate of an alkali metal. They further state that "by our process we obtain electrodeposits of chromium of great purity for various industrial uses." The patents of Placet and Bonnet expired in 1911, so they became public property in the United States and thereby established prior art in the eltctrodeposition of chromium from chromic acid soluuions which is the basis of all cromium plating solutions today; whether used as strictly commercial solutions or whether surrounded by a halo of a fourth of a hundred patents.

The splendid work done on chromium and the electrolysis of chromic acid by Dr. H. R. Carveth and B. E. Curry, as outlined in a paper read at the seventh general meeting of the American Electrochemical Society held at Cambridge, Mass., April 26, 1905, substantiate the claims made by Placet and Bonnet. Samples of chromium-plated deposits were also shown at this meeting by the investigators.

If you desire to read the splendid work these investigators did for what we can now safely term the commercial electrodeposition of chromium, you can do so in the Transactions of the American Electrochemical Society, Volume 7, 1905, pages 115 to 142. It is worthy to note that these gentlemen state in their paper that "Our results prove conclusively that Placet and Bonnet were right in stating that metallic chromium could be obtained by the electrolysis of commercial chromic acid. We have made a large number of runs to find the effect of certain variables mentioned on the nature of the deposit."

Platings made without stirring the solution and without finishing the metal deposited by buffing, etc., resemble the very finest of work done on silver. In fact, for plating purposes the metal should have a great future before it. They also substantiated the claims of Reese that a commercial chromic acid was the most satisfactory material to use; Reese had previously stated that with pure chromic acid he was unable to get any reduction whatever; twenty-two years afterwards in our own Research Department (R. & H. Chemical Company) we found Reese's contentions to also be true with respect to commercial chromic acid. Solutions of commercial chromic acid, however, cannot be used exclusively for chromium-plating every type of article fabricated from commercial metals, but can be used successfully in plating gauges, dies, punches and many other articles made from steel that can be made more efficient, more durable, more lasting, with a deposit of chromium upon their surface.

We now pass on to "A paper read at the ninth general meeting of the American Electrochemical Society at Ithaca, New York, May 3, 1906, by M. LeBlanc, entitled 'Electrolytic Chromium.'"

Le Blanc comments upon the investigations of Carveth and Curry in more or less uncertain terms, but in the light of present day developments we know that their statements were correct.

Le Blanc, however, determined the value of chromic sulphate and also the organic acids, boric and oxalic, as mentioned by Placet and Bonnet, when added to chromic acid chromic sulphate solutions with varying amounts of 5 to 10 grams per litre of solution. Le Blanc states that in order to test the action of boric acid he made experiments in this line; he then gives comparative tables in proof of the results and concludes: "Here, therefore, by the addition of 0.5 grams of H_3BO_3 to 100 c.c. of solution a beautiful smooth white metal coating was obtained."

For the experiments which were now to be carried on on a larger scale therefore a solution of this composition was used.

Le Blanc's paper is worthy of perusal because it substantiates Carveth and Curry's work and the claims made by Placet and Bonnet and gives to the metal fabricating industry the right to use chromium plating solutions advocated by them and substantiated by Carveth and Curry and Le Blanc.

We know from the splendid paper by Paul W. C. Strausser, Detroit, Mich., read at the Annual Convention of the American Electro Platers' Society, Newark, N. J., June 28th to July 1st, 1926, that the chromium solution was used by him in his experimental work and later presumably used in chromium plating by a well-known automobile manufacturer in the Middle West as advocated by Placet and Bonnet and substantiated by Carveth and Curry and Le Blanc.

George T. Sargent in his excellent paper covering the Electrodeposition of Chromium, Transactions of the American Electrochemical Society, Volume 37, page 479, 1920, does but little more than substantiate previous work

done by preceding investigators mentioned previously.

Sargent's work was done at Cornell in 1906 and 1907. That it showed that commercial results were obtainable is shown by the fact that they obtained deposits of metal one-half an inch thick! Surely Sargent's deposits would be of thickness satisfactory for plating or any other purpose.

Sargent's work was directed and financed by Prof. W. D. Bancroft and Dr. H. R. Carveth, who in 1918 became vice-president of the R. & H. Chemical Company. This work was not published until 1920, as it evidently had been the idea of the promoters of the research again to take it up and commercialize it.

Sargent gave a definite working formula that is the basis of all present commercial chromium plating solutions as follows:

Water	1 litre
Chromic Acid	245 grams
Chromic Sulphate	3 grams
Concentrated Sulphuric Acid	5 c.c.

If you replace the sulphuric acid of Sargent's solution with boric acid as advocated by Le Blanc then the results are the well-known formula of a large automobile firm. If chromic carbonate advocated by the Bureau of Standards is replaced with boric acid, then practically an identical solution with Sargent's formula results. The addition of chromic carbonate advocated by the Bureau of Standards gives a distinctive chromium solution. It is not patented yet but gives wonderfully good results.

Sargent advocated the use of lead anodes, this type of anode in connection with steel anodes gives splendid results. When internal anodes must be used to give throwing power, then lead anodes should be used due to their flexibility. Sargent states with the use of lead anodes that chromic acid reduced at the cathode was oxidized back to chromic acid at the anode. Thus the plating solution could be maintained easily at a desired composition at a valence of three.

An excellent paper worth considerable considertation is "Notes on the Plating of Chromium on Steel," by George M. Enos, presented at the forty-eighth general meeting of the American Electrochemical Society held in Chattanooga, Tenn., September 24-26, 1925.

This paper, from investigations made, proves that chromium plated steels cannot be heat-treated as can ordinary tool steels or chrome steels. The selected bibliography in this paper covering work done on chromium up to 1923 is excellent. Four German patents, and five British patents, and one American patent is referred to. The latter is Placet and Bonnet's patent of 1894.

So we come down through a fifth of a century to 1927 and the commercial metal fabricating and electroplating industry must decide eventually whether they will stand shoulder to shoulder in the defense of chromium plating as a purely commercial process, established for them by the expiration of the Placet and Bonnet patent and the investigations made by Carveth and Curry, by Le Blanc, by Sargent and by Strausser, or whether they will pay the penalty of royalties of abused privileges in so-termed patents that have been obtained as a subterfuge to confuse real issues based upon prior art established by men who did their work fearlessly and well, without obtaining patents to cover their labors that might have resulted in financial returns.

In conclusion of this paper I want to mention for your information the chromium solutions that are now in use commercially every day in the Middle West and which must be considered as commercial solutions unburdened with any patent:

SOLUTION No. 1

Chromic Acid	1 gal.
Water	32 ozs.
Chromic Sulphate	1 oz.
Boracic Acid	¾ oz.

SOLUTION No. 2

Water	1 gal.
Chromic Acid	33 ozs.
Chromic Sulphate	1 oz.
Chromic Carbonate	4/10 oz.

SOLUTION No. 3

Water	1 gal.
Chromic Acid	20 oz.
Chromic Sulphate	1 oz.
Boracic Acid	¼ oz.
Chromate of Iron	1 oz.

Anodes for any of these solutions may be heavy sheet steel, sheet lead or chrome steel (20 to 40 per cent). The latter anodes have a distinct advantage because they reduce very slowly in solution resulting in chromous chromates and iron chromate in solution.

There is one distinct advantage in solution No. 3 which the writer developed, especially if chrome steel anodes are used, the dangerous and poisonous gases emitted from the usual solutions are reduced to a minimum.

A very large manufacturing firm in the Middle West operates this type of solution continuously without any unusual protection other than used for ordinary nickel solutions.

Chromium deposits are of most value when applied to nickel plated surfaces with a very high lustre first applied to the basis metal. For hardness and wear the metal can be applied direct to the steel or iron surface.

The procedure to follow in preparing the several solutions is as follows, as well as their electrical control and upkeep.

First. Dissolve all the materials in water heated to 180 degrees Fahrenheit.

Second. The tank container should be preferably of glass coated steel, or a welded steel tank may be used.

Third. The steel tank should be insulated from the plating room floor (no matter what the floor may consist of) with suitable supports covered with hard rubber at least one inch thick, or a waterproof fibre.

Fourth. The tank should be connected up with iron or lead steam coils, the valve control arrangement should be so that either steam can pass through the coils for heating purposes or cold water to reduce the temperature.

Fourth. The variable temperatures in chromium plating may be from 95 to 120 degrees Fahrenheit.

Fifth. The current pressure available should average from 6 to 12 volts, amperage from 125 to 500 amperes per square foot of surface area. Volt and ampere meters should be used in control of the solutions.

Sixth. In large plating operations the anodes, either steel or chrome steel, should average one-fourth inch thick, four inches wide and length equal to the length of the articles to be chromium plated.

Seventh. When the solution is first prepared the density of the solution should be carefully registered with a Baumé Hydrometer, the water or solution line in the tank should always be maintained so that the reduction in density may be noted when the solution is in operation.

When the density falls below normal it denotes that the solution requires chromic acid to replace the chromium metal deposited out. In addition small amounts of chromic sulphate and boracic acid should be added. When chrome steel anodes are used exclusively then commercial chromic acid is the only material except water that is necessary to add to the solution.

Eighth. All metal surfaces should be as chemically clean as for other metals that are commercially plated.

Ninth. All electrical contacts and supporting wires must be of sufficient thickness to overcome the resistance due to the high currents required.

Tenth. The chromic acid should be a special commercial acid according to the following analysis:

Chromic Acid Dry CrO_3	99.04 %
Bisulphate of Soda $NaHSO_4$	0.05 %
Insoluble in Water	0.055%

No other impurities except moisture.

The experimental data covering our research work in the R. & H. Research Laboratories on No. 3 solution as compared with the Bureau of Standards Formula is as follows:

Objects: (1) To study the cathode current efficiencies of two concentrations of chromic acid in a chromium plating bath suggested by Mr. Proctor.

(2) To determine the effect upon the cathode current efficiency of chromium deposition produced by the addition of 7.5 g/L of iron chromate furnished by Mr. Proctor.

Summary: (1) Of the three satisfactory chromium baths here dealt with, the one containing 1 oz./gal. of iron chromate proved the best from bath, the standpoint of color and cathode current efficiency.

(2) The cathode current efficiencies of these three baths at 240 to 250 A/SF varied from about 11 per cent to 14 per cent, based on hexavalent chromium.

(3) The best chromium plating conditions found to date are summarized as follows:

BATH COMPOSITION

Chromic acid	16 oz/gal.
Chromic sulfate c.p.	1 oz/gal.
Iron chromate No. 348	1 oz/gal.
Boric acid c.p.	⅔ oz/gal.
Temperature	46 to 50° C.
Anodes	Sheet steel
Ratio of anode to cathode surface	About 1 to 1
Cathode Current Density	About 240 A/SF.

DETAILED REPORT

CHROMIUM PLATING BATH COMPOSITIONS

	No. 1	No. 2	No. 3
Chromic acid	16 oz/gal.	16 oz/gal.	32 oz/gal.
Chromic sulfate c.p.	1 oz/gal.	1 oz/gal.	1 oz/gal.
Boric acid c.p.	⅔ oz/gal.	⅔ oz/gal.	⅔ oz/gal.
Iron chromate (No. 348)		1 oz/gal.	
Volume of solutions	2 L.		
Temperatures	46 to 55° C.		
Anodes	Drum sheet steel		
Anode area in each bath	20 sq. in.		
Steel cathode area in each bath	4.5 sq. in.		
Cathode Current Density	240 to 250 A/SF.		

Other details of the electrolyses are given below:

Run No. 1. Baths No. 1 and 3 were run in series for 15 minutes each. The following weights of coatings were produced:

Bath No. 1: 0.071 g. or 0.080 oz/SF.
Bath No. 2: 0.073 g. or 0.082 oz/SF.

Run No. 2. Baths Nos. 1 and 3, and a copper coulometer were all run in series for 12 minutes with the following results:

Wt. of Cu Coul. cathode 1.396 g. Cu or 1.177 amp. hrs.
Wt. of Bath No. 1 cathode 0.0545 g. or 0.061 oz/SF.
Wt. of Bath No. 3 cathode 0.0528 g. or 0.059 oz/SF.
Cathode Curr. Eff.
Cathode Current Efficiency Bath No. 1, 13.86%.
Cathode Current Efficiency Bath No. 3, 14.30%.
(Based on hexavalent chromium)

Run No. 3. 1 oz/gal. of iron chromate was added to Bath No. 1, making Bath No. 2 given above. Baths Nos. 2, 3 and copper coulometer connected in series.
Time of run 30 minutes.
Wt. of Cu Coul. cathode: 2.691 g. or 2.27 amp. hrs.
Wt. of Bath No. 2 cathode: 0.105 g. or 0.119 oz/gal.
Wt. of Bath No. 3 cathode: 0.093 g. or 0.104 oz/gal.
Cathode Current Efficiency Bath No. 2, 13.61%.
Cathode Current Efficiency Bath No. 3, 12.65%.

Run No. 4. Check of Run No. 3 (35 minute deposits).
Wt. of Cu Coul. cathode: 3.25 g. or 2.74 amp. hrs.
Wt. of Bath No. 2 cathode: 0.125 g. or 0.141 oz/SF.
Wt. of Bath No. 3 cathode: 0.112 g. or 0.126 or/SF.
Cathode Current Efficiency Bath No. 2, 12.26%.
Cathode Current Efficiecy Bath No. 3, 11.00%.

Run No. 5. Check of Run No. 3 (35 minute deposits).
Wt. of Cu Coul. cathode: 3.27 g. or 2.76 amp. hrs.
Wt. of Bath No. 2 cathode: 0.135 g. or 0.152 oz/SF.
Wt. of Bath No. 3 cathode: 0.125 g. or 0.141 oz/SF.
Cathode Current Efficiency Bath No. 2, 13.15%.
Cathode Current Efficiency Bath No. 3, 12.17%.

Remarks: All the deposits were smooth and bright. Those from Bath No. 2 being exceptionally bright. It should also be noted that the addition of the iron chromate increased the cathode current efficiency of Bath No. 1 slightly (about 1%).

The analysis of the iron chromate used is as follows:

Cr_2O_3—48% Fe_2O_3—17% SiO_2—7%

The utility of this material may thus be due to the formation in the solution of colloidal chromic chromate, iron chromate, or both.

Platinum Solution

By Horace H. Smith *

PLATINUM BATH

Half ounce platinum dissolved in aqua regia, evaporate until syrupy, add one pint of water, then add saturated solution of ammonium phosphate until all platinum is precipitated. Boil until all ammonia is evaporated. Test with red litmus paper until it no longer turns blue. Then add one ounce phosphate of soda and one ounce pyrophosphate sodium. Add water to make one quart. Use at 180 deg. Fahr., 5 to 6 volts.

PLATINUM NO. 2

Dissolve 1.25 dwts. of platinum in aqua regia (1 oz. of hydrochloric acid to ¼ oz. of nitric acid.

Boil and renew the aqua regia if necessary until the platinum is dissolved. When all of the platinum has dissolved, boil down the solution until most of the acid is gone and a brown syrup liquid is left. Do NOT allow it to dry out.

Weigh out 12 dwts. of ammonium phosphate and dissolve it in 2 ozs. of boiling water. Pour this solution into the platinum solution and stir the mixture. (This will destroy the acid remaining with the platinum and give a thick light yellow mixture of platinum ammonium phosphate.)

Weigh out 80 dwts. of sodium phosphate crystals and dissolve in 3 ozs. of water. It will be NECESSARY to boil the mixture to dissolve all of the sodium phosphate. While hot, this solution is poured into the platinum ammonium phosphate, and the whole mixture boiled down to 4 oz.

(Sodium phosphate can be bought as the dry salt, or in crystals. If the dry salt is used, weigh out 32 dwts. in place of the 80 dwts. of crystals. Containers of sodium phosphate crystals are either marked CRYSTALS or $Na_2HPO_4 .12H_2O$.)

The above solution should be diluted with 6 or 7 times its volume of water before using.

*From The Monthly Review of the American Electro-Platers' Society.

Plating Racks for Plumbing Supplies

How to Rack These Parts for Electro-Plating

Written for The Metal Industry by WILLIAM E. BELKE, President, Belke Manufacturing Company

Having covered the elementary principles of making plating racks, and the problem of racking automobile accessories, we have chosen as the next important field the plumbing industry, in which many unique situations are encountered.

In general, it is wise to consider each product separately, and try to create a tip best adapted to its treatment, but it will be found that many articles, entirely different in use, will have the same general appearance and, consequently, can be plated on the same tip. For instance, we can plate a wall shield, which is only a rim of metal, on the same tip which would be used for the rim which holds the glass into an automobile headlight, and for a rim used in chandelier making.

Thus, one tip will serve for products of three industries.

The main things to be considered in rack tips are:

Will it hold the article securely?

Will it touch any part which should be plated?

Will it permit the article to be taken on and off easily?

If it will hold the article securely, preventing it from being washed off, does not touch any part to be plated, and allows a maximum number of pieces on one rack, each one easy of access, then the tip is perfect, if it be for one ton doors or small rings.

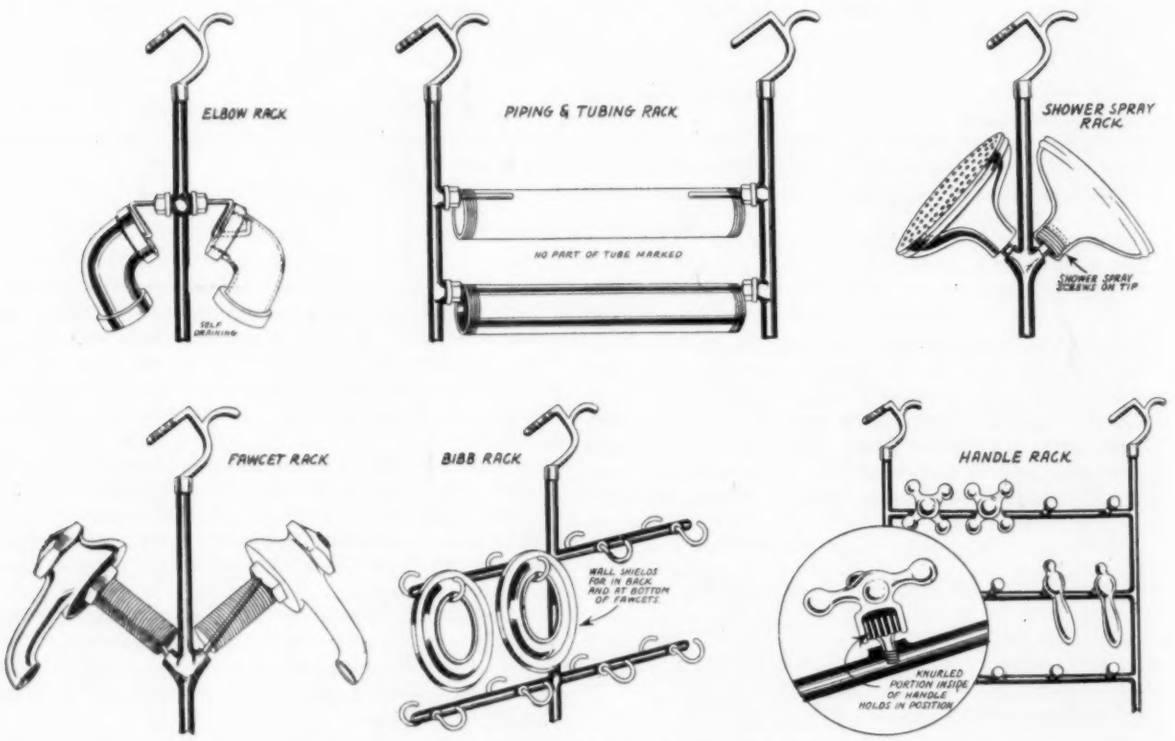
In this article we are introducing an entirely new topic. It is the desirability of having a tip which will hold the product sufficiently secure to allow cleaning of the product while on the rack. It is a great time saver to place a product on the rack before the cleaning operation, go through this operation, and then plate and wash, without removing it from the rack.

This feature will be found in the illustration which shows the shower spray rack. The tip is of the same diameter as the inside of the lower part of the shower spray, and is threaded. When racking the employee screws the shower spray onto the tip, and he can go through the three operations of cleaning, plating, and soaking without touching the spray.

The same principle is employed in the handle rack, where all types of handles can be cleaned, plated, and soaked without removal from the rack. A knurled tip holds the inside of the handle perfectly tight.

A novel situation was found in the old days when platers encountered the elbow. They would make a rack with an upturned tip, upon which the elbow would be slipped. When they used this rack for cleaning, it was found that a considerable amount of cleaning solution remained at the bottom of the elbow, which formed a reservoir. If the elbow was large enough, and many were placed on one rack, it would happen that a rackful of elbows would transport almost a quart of cleaning fluid to the plating tank. The cleaning tank would be nearly emptied in a day or so, and the plating tank would be so polluted that it was worthless. With the tip shown the elbow is allowed to hang downward thus draining itself. The tip holds the elbow on the inside, and catches in the threads.

In the racks for plating piping and tubing, it will be noted that two entirely separate racks are used for each set of pipes. The rack is constructed with tips on one side only, each tip about three inches long, and made of quarter-inch phosphor bronze, for stability. One rack is placed on one side, the tip is inserted into the end of the pipe, and the other rack holds up the other side. The object of separating the racks is so that piping and tubing of any size can be used.


ELBOW RACK
SELF DRAINING
PIPING & TUBING RACK
NO PART OF TUBE MARKED
SHOWER SPRAY RACK
SHOWER SPRAY SCREWS ON TIP
FAWCET RACK
BIBB RACK
WALL SHIELDS FOR IN BACK AND AT BOTTOM OF FAWCETS
HANDLE RACK
KNURLED PORTION INSIDE OF HANDLE HOLDS IN POSITION

RACKS FOR PLUMBING SUPPLIES

The faucet and bibb rack are self-explanatory, and show that the main object is to hold them securely, and not allow the tip to touch any part which will be plated. In the case of the faucet rack it will be noted that it, too, is self draining. The bibb rack, used for wall shields, which are placed at the bottom and back of the faucets, has a tip formed in a two-thirds circle, which prevent the shields from swinging off.

It is appropriate to explain here the benefits of removable tips. In addition to the benefit of removing the tips when it is plated heavily, or salvaging the spine by removing a broken tip, it will be found convenient for the plater to insert different tips for odd orders.

For instance, many plating plants will have hundreds of hard-rubber covered racks, each with tips running from five to one hundred to a rack, representing a large investment. These tips are adaptable for the products which are regularly plated, but it may happen that an order for an odd-shaped article will be received. If this article is not regularly plated, and the order is not large enough to deserve ordering racks for it, a great saving will be realized by replacing the tips on the racks already on hand with new tips to fit the new article.

We impressed, in the first article, the advisability of having tips which are attached to the racks by screwing, so that they could be replaced easily. This benefit is best seen in a situation such as that described, when the tips may be taken out and a small investment in new tips for the odd shaped article is all that is necessary.

In all cases, when the problem of a different tip for each product comes up, one must consider the merits of the case on hand.

We advise a stock of racks and tips adaptable for every purpose, but strongly advise against overloading the stock so that the plater does not get his money's worth.

Water-cooled Moulds

By JAMES SILBERSTEIN

The quality of a worked metal depends to a great extent on the freedom from defects of the cast ingot or billet, from which it is produced. This interdependence of cast ingot and worked product has become more thoroughly realized in recent years in non-ferrous metallurgy, with the result that increasing attention has been given to the control and improvement of foundry practice and the elimination of defects in ingots.

Two important factors influence the quality of ingots and the behavoir of the moulds and the process of solidification. Some of the chief defects related to these are discussed by O. Junker in the "Zeitschrift fur Metallkunde" of October, 1926, with special reference to brass and bronze castings.

The material commonly employed for ingot moulds is cast iron. Since the introduction of such moulds, design and construction has changed very little, and many difficulties and disadvantages are encountered in their use. Cracks are formed, which cause defects in ingots and lead to spills and blisters in rolled sheets. The cracks are caused by excessive heating of the mould faces in contact with the molten metal. Dressings become baked on and difficult to remove between pourings. The cooling down between pourings takes a long time and a large number of moulds is therefore necessary to obtain maximum production.

These difficulties and disadvantages can be successfully overcome and further important advantages obtained by means of water-cooled moulds. These moulds have been introduced in European, especially German brass works a number of years ago. Some of these moulds have been in service for twelve years and are still in good condition.

The thermal conditions set up in the two classes of moulds are illustrated in Figs. 1 and 2. They show the temperature gradients in cross sections, including one wall, of a water-cooled mould and an ordinary cast iron mould respectively. Taking the ordinary mould first, Fig. 1, the temperature gradients 10, 20, 30, and 40 seconds after commencement of pouring, show progressive heating of the mould face from δ_1 to δ_4. This heating of the face can be reduced by increasing the wall thickness, but a limit is soon reached, beyond which further increase is of little practical value. Increase of thickness beyond this merely adds weight and bulk to the mould.

An entirely different state of temperature conditions is obtained with the water-cooled moulds, Fig. 2. The heat-storing capacity of the thin wall is comparatively small. The amount of heat, which travels from the molten metal to the wall is therefore about equal to the amount of heat which travels from the wall to the water. The temperature gradients δ_1 δ_2 set up in the mould wall is controlled by the nature and thickness of the material; the

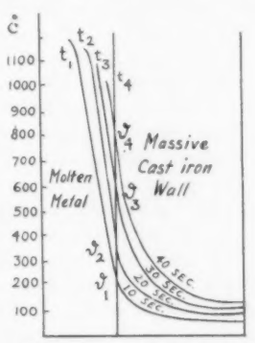


FIG. 1. TEMPERATURE GRADIENT WITH ORDINARY MOULD

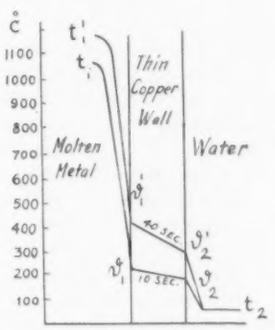


FIG. 2. TEMPERATURE GRADIENT WITH WATER-COOLED MOULD

temperature δ_2 at the mould-water face is controlled by the temperature t_2 and the rate of flow of the water and the gradient δ_1 δ_2 can be maintained practically unchanged during pouring. The rate of solidification in the mould depends on the temperature difference between metal and mould face. In the water-cooled moulds this difference t_1-δ_1 is, therefore, maintained at a maximum, conforming to the gradually falling temperature of the melt. This leads to a uniformity of structure in ingots, with freedom from coarse grained cores, shrinkage and gas cavities. Pours can be made in the same mould at very short intervals and a large number of moulds is not required. Dressings do not bake on, and all that is necessary between pours is brushing out with a soft brush. The mould faces remain good after thousands of pour.

An important field of application for water-cooled moulds lies in the casting of the large aluminum alloy ingots called for nowadays for manufacture of large forgings. The difficulty of maintaining a sufficiently rapid rate of solidification in large masses of these alloys in order to avoid coarse structure and unsoundness is very great when the metal is cast in ordinary cast iron moulds.

Testing Plated Coatings

A Rapid and Practical Method of Applying the Ferroxyl Test to Protective Coatings—A Paper Presented at the Thirtieth Annual Meeting of the American Society for Testing Materials at French Lick, Ind., June 20 to June 24

By KARL PITSCHNER

Chief Chemist, Research Department, American Chain Co., Bridgeport, Conn.

The principle of the "ferroxyl" reagent has long been used in the detection of porosity in electroplated coatings on ferrous metals. The usual method of applying the test has been described by Wm. Blum and C. F. Thomas in a paper presented in September, 1925, before the American Electrochemical Society.[1] Briefly, a hot solution containing potassium ferricyanide ($K_3Fe(CN)_6$), sodium chloride (NaCl), and agar-agar is flowed in a thin layer over the surface to be tested. This solution quickly hardens to a jelly as it cools. The sodium chloride reacts with the iron exposed at the pin holes. A little iron goes into solution and reacts with the potassium ferricyanide, forming a deep blue coloration in the immediate vicinity of the hole in the coating which is probably Prussian blue, a mixture of a number of ferrocyanides. If a permanent record is required, the layer of jelly is removed intact to glass or paper and dried.

In practice, this method of applying the "ferroxyl" reagent requires careful manipulation and proves very tedious. The operation must be performed in a dust-free atmosphere to prevent contamination of the solution. This fact excludes its use as a practical plating room test. The reagent must be kept hot in a water bath which is usually not convenient. With continued heating it is almost impossible to keep the solution from becoming lumpy, due to a film drying on the surface and later breaking up into small bits. If a permanent record is desired, the solution must contain exactly the right concentration of agar-agar, so that it will be sufficiently fluid to flow readily over the surface and still harden quickly to the point where it may be removed intact. The author found, at the beginning of his work on this reagent, that substitution of 20 per cent of ethyl alcohol for that amount of water improved both flowing and hardening qualities. In making a permanent record, the transference of the jelly film from the surface tested to paper requires the most careful handling, and even then very frequently a breaking of the film results. Necessarily, the surface from which a permanent record can be made is very small, at the most eight to ten square inches. In drying the film on paper, the agar shrinks, the paper is discolored and warped, the original dimensions of the area tested are lost, and the salt frequently crystallize out, which results in an unsightly and unreliable record.

These difficulties and faults in the application of the "ferroxyl" test as a practical routine method for platers led the author to study various means of improving this test and adapting it to use in the shop as well as the laboratory. The idea was conceived of coating paper with a thin film of the reagent and immediately spreading it over the surface to be tested, allowing it to remain for a few minutes. Fairly good records were obtained in this way. Later it was found that the reagent could be sprayed on the paper, dried in an oven and the paper kept indefinitely without deterioration. Paper prepared by this second method was merely moistened on the sensitized side and spread over the dry surface to be tested. After removal it was found possible to wash all the reagent out of the paper with water, leaving only the blue spots indicating the pin holes.

The first prints made with the sensitized paper showed the pin holes only with a light blue color. The "ferroxyl" reagent for treating the paper had been made up according to directions in the paper by Blum and Thomas, mentioned previously. While this solution was found very satisfactory when spread in a comparatively thick layer directly on the surface to be tested, it was evident that the concentration of the compounds entering into the reaction was not sufficiently high to get the best results with a thin film of the dried reagent on paper. Accordingly, the concentration of the various ingredients was increased 50 to 100 per cent. A part of the water was replaced by ethyl alcohol. This altered solution was filtered while hot through glass wool in a 250-cc. dispensing burette held over a gas hot-plate to keep the solution from solidifying. This filtration removed all foreign material and clots of blue coloration in the solution.

The paper sprayed with the altered reagent proved very satisfactory. The blue coloring at the pin holes became intense. The boundaries of the spots became very definite due, no doubt, to greater amount of agar-agar present. At this time the paper was being tested on a double coating of nickel plate on copper plate on steel. A few brownish-red spots were noticed on some of the test papers which had been used. Tests on a nickel plate on pure copper sheet proved that the red spots were due to pin holes through to copper but not to steel. The brownish-red compound formed is probably copper ferrocyanide. It was later found that by using a solution of ammonium citrate and ammonium carbonate instead of water for moistening the paper, a record could be obtained of the porosity of nickel or chromium plate on a copper or brass base which was fully as definite as the print through to ferrous base. However, the solution of ammonium citrate should not be used when porosity through to a ferrous base is to be tested, as it hinders the formation of the blue coloration. For testing automobile bumper bars, first plated with copper and then with nickel, the test paper will show pin holes through to the iron, pin holes through to the copper, and the points where the nickel is almost buffed through to the copper.

We have found that this altered method of applying the "ferroxyl" test to determine porosity has the following advantages:

1. No equipment is required.
2. The only supplies needed are test paper and water. If the material to be tested is greasy, a solvent like carbon tetrachloride should be used to clean the surface before applying the paper.
3. Contamination from dust in the air is reduced to a minimum by the rapidity and mode of application.
4. Any person can apply the test without previous instruction.
5. The test is complete in about three minutes including washing out of excess reagent.
6. The test is non-destructive. If the bar is washed off soon after the paper is removed, buffed surfaces are not even tarnished.
7. A permanent record of quality of production in the plating plant is obtained. All of the above features make this method of applying the ferroxyl test of value to plating departments and to buyers of electroplated work.

[1] Transactions, Am. Electrochemical Soc., Vol. XLVIII, p. 69 (1925).

8. Any size prints may be obtained by laying down adjoining sheets of the paper. The sheet used is, of course, limited to a size and shape which can be rapidly and conveniently handled.

9. The porosity of material such as tin and aluminum foil may be tested by placing the foil on a surface of iron and applying the paper on top of the foil.

10. For testing nickel and chromium plate, the ferroxyl test as compared with the salt spray will show up in three minutes all of the failures which the salt spray will develop in 25 to 50 hours. If a print is made by means of the paper and the sample then put into the salt spray, the points of failure of the coating can be checked point for point by comparing the print and the bar from salt spray.

Figures 1 and 2 are intended to illustrate the relation between the spots on the paper and the corrosion of the steel beneath the plating.

Figure 1 (*a*) shows a piece of steel bumper bar plated with about 0.0007 in. of nickel, direct on the steel. The ferroxyl print made at the time that the original bar was photographed is shown in Fig. 1 (*b*). All of the spots in this case are dark blue, showing pin holes through the nickel plate to the ferrous base. Figure 1 (*c*) shows the bumper bar after 45 hours in the salt spray. A comparison of Figs. 1 (*b*) and (*c*) shows that practically all points of failure under the salt spray were predicted beforehand by the spots on the ferroxyl paper. Points marked *X* and X_1, for example, show the same groups on the test paper and on the steel bar after the salt spray.

Figure 2 shows the same prints made of another bar which was first plated with copper, then with nickel. A close observation of Fig. 2 (*b*) will disclose two classes of spots of different intensities. The dark spots, comparatively few in number, show pin holes through both plated coatings to the ferrous base metal. These were colored a deep blue on the original print. A typical spot of this type is shown at *Y* on Fig. 2 (*b*) of the test paper print. Y_1 on Fig. 2 (*c*) shows the same locality as a rust spot on the steel bar after 45 hours in the salt spray. The many lighter spots typically shown at *Z* in Fig. 2 (*b*) are colored a reddish brown on the test paper, indicating a pin hole through the nickel to the copper plate, but not extending through the copper to the steel. A comparison of Figs. 2 (*b*) and (*c*) shows that this class of spots does not appear as rust spots on the bar when removed from the salt spray after a period of 45 hours, due to the protecting copper.

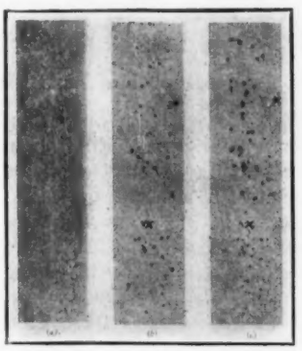


FIG. 1. FERROXYL PRINT. NICKEL ON STEEL

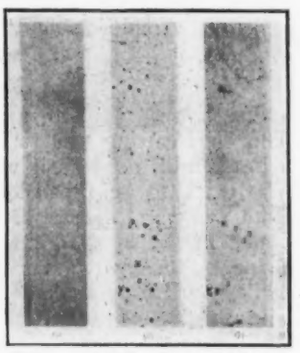


FIG. 2. NICKEL ON COPPER ON STEEL

Discussion by GEORGE B. HOGABOOM, Research Electro-Plater
The Hanson & Van Winkle Company, Newark, N. J.

This method of testing nickel deposits is most opportune. The demand for good nickel plating, one that will afford a better protection against corrosion is insistent and is a necessity especially in the automotive industries. It is well known that nickel does not protect steel or iron against corrosion in the same manner as zinc. Rather it accelerates corrosion. The only condition under which a nickel deposit can be of any protection is for the nickel to be free from porosity.

The salt spray test for determining or computing the life of a nickel deposit is not satisfactory. This test has never been standardized, yet it is universally applied to nearly all electro-plated deposits and in many specifications a definite duration of a deposit in a salt spray is required. It was developed for testing zinc coatings and without any data as to its value has been designated as a test for nickel deposits.

Zinc has the property of exerting a protective influence over any small uncoated surface. The value of the salt spray test lies in the rate of the solubility of zinc in a salt solution. It detects thin deposits more rapidly than it does actual porosity. Nickel does not have the same rate of solubility in salt solution as zinc. It does not have that protective influence over any uncoated surface. The value of the salt spray test is based upon its attack of the base metal which is exposed due to the porosity of the deposit. The exposed part is often so small that the created rust is washed off by the spray and cannot be detected. While rough comparative tests can be made they are in no way reliable, and the data obtained from a series of tests at one manufacturing plant are not comparable with tests made at another plant. At its best the salt spray test does not give the accuracy desired. At a recent meeting of the Electro-platers and Depositors' Technical Society, a branch of the Faraday Society in England, this was recognized and a resolution was passed calling for the standardization of the salt spray test.

The value of the ferri-cyanide, and agar-agar method is given in the paper under discussion.

The Pitschner paper describes a unique and reliable method for obtaining permanent and comparable data on the porosity of nickel deposits. The method is simple and rapid and furnishes a record which makes it ideal.

This test paper described has also been found of assistance in detecting thin deposits of nickel from solutions having poor throwing power, that is, the ability to deposit metal in deep recesses. It also indicates uneven distribution of deposits due to the incorrect placing of anodes or to not replacing worn anodes. From solutions that have poor throwing power the deposit in deep recesses is thin and consequently very porous. By testing the deposit on the high lights and on the recesses with Pitschner's paper a rapid method of determining the throwing power of a nickel solution, is had. While this is by no means accurate it is a good indication and is convincing to a person not versed in technical methods. If a piece of work is plated directly in front of an "old" anode, one that is almost entirely corroded, and another piece of work in front of a "new" anode the former will have considerably less nickel deposited on it. This is readily shown by the porosity of the thin deposit brought out by Pitschner's paper and offers a visible proof to those in charge of the electro-plating. This point clearly demonstrates the value of a moving cathode arrangement where all work travels in front of every anode, regardless of its area, the same length of time. In this way alone can a uniform deposit be obtained.

Mr. Pitschner is to be commended for bringing out this clever and simple method for testing the porosity of nickel deposits. It is a test that is far more reliable than any that has been previously been developed.

Since writing the above discussion another interesting use of Pitschner's paper has been investigated.

The porosity of brass or copper deposits on cold rolled steel is shown by applying the paper directly to the plated surface. Copper colors the whole surface of the paper brown; brass has a slight effect on the color of the paper. On both copper and brass plated cold rolled steel the blue spots appear distinctly on the paper where it comes in contact with the places without a deposit.

It was found that when the brass or copper deposit was porous that "spotting out," or to be more correct, "spotting in" occurred. It was also learned that certain lacquers affect steel more readily than others, and when used for lacquering brass or copper plated articles the bare spots of steel in a very short time became discolored. This was especially evident when lacquers were used that were acid or when highly water soluble thinners were added to other lacquers. When both an acid lacquer and a highly water soluble thinner was applied the discoloration developed in a shorter time.

Further work will have to be done before the above statements can be definitely proved, but they offer a clue to one of the causes of that unsolved difficulty. The investigation should include the causes of porous deposits.

The porosity of deposits from brass or copper cyanide solutions, in all probability, will be found due to high metal concentration; or high alkali content, either a hydroxide or a carbonate or both, the presence of a detrimental chloride, the amount of porosity depending upon any one or any combination of the conditions stated.

Welding a Brass Extrusion Press

Repair of Extrusion Press Saves $4,000

The large press shown in Fig. 1 cracked in operation. This steel casting was an important unit in production in a brass mill, used as it was in forming metal to shape. The work to be formed is placed in a mold or "die." Both work and die are then placed in the press and subjected to pressure, which forms the metal in the desired shape. Shapes of intricate cross section can often be made more economically by extrusion than by rolling. The pressure required, of course, depends upon the elastic limit of the material, and may be as high as 120,000 lb.

On being advised that the cylinder could be repaired by oxwelding, the company determined to have this done in spite of the fact that it would be a much larger job than the plant operators had ever completed. All the necessary arrangements were quickly made. The preheating furnace shown in Fig. 2 was built with an improvised roof over it to protect the cylinder from a threatening storm. Because of the size of the press, special care was taken with preheating. Air lines were arranged to direct blasts of air on the operators for their comfort during welding.

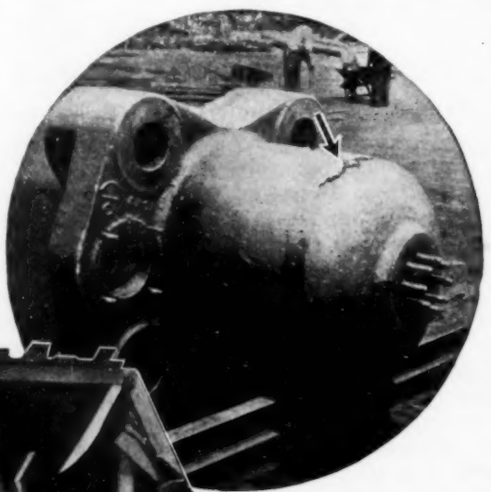


FIG. 1. EXTRUSION PRESS CRACKED

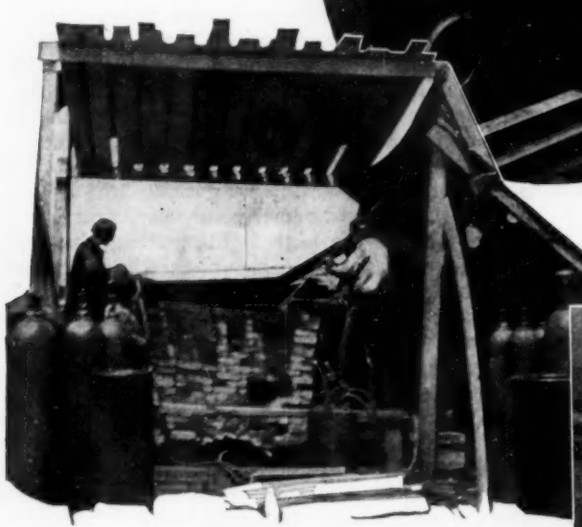


FIG. 2. ON THE JOB

Because the crack ran so low on one side, it was difficult to start the welding. A deep pocket was found in the casting (probably the cause of failure) and the blowpipes became so hot while working this defect out that the operators had to change blowpipes frequently. A helper then cooled and adjusted the overheated tips. After welding continuously from the morning of the first day until 6 o'clock that evening, the two operators were well tired out, so it was decided to hold the preheating fire through the night and continue actual welding the next morning.

At 5:30 o'clock the next morning the welding team again started work. From then on they worked steadily until 4 o'clock next morning. Two days after the work was completed, the preheating furnace was uncovered.

About noon, next day, the furnace was torn down and the weld dressed. It was found that the cylinder bore was only .002" out of round.

A new extrusion press would cost $2,300. The time that would have been lost, as a result of the shut-down of the unit, while a new press was being secured, was estimated at about $2,000 in value. Add the cost of erecting a new machine. Since the entire reclamation job cost only a few hundred dollars, oxwelding saved the company at least $4,000.

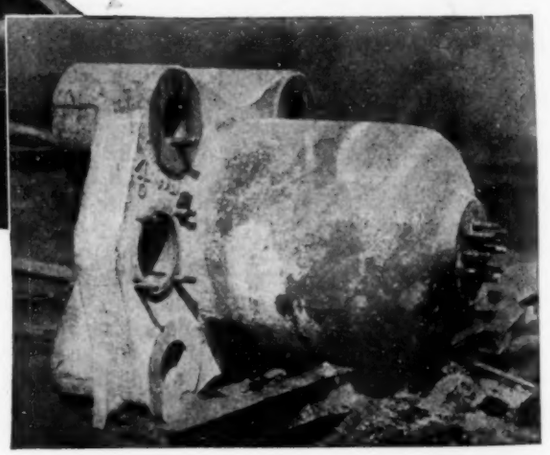


FIG. 3. ONLY .002 INCHES OFF

Electro-Platers at the Toledo Convention

HENRY SCHULDT
Chairman, Convention Committee, Toledo Branch, A. E. S.

The July issue of THE METAL INDUSTRY went to press immediately after the close of the convention in Toledo, Ohio, June 29- July 2, of the American Electro-Platers' Society. For that reason it was impossible to get photographs in time to include them in the report of the proceedings. Following, however, are photographs of the assembled electro platers and their guests; also some of the newly-elected officials of the two organizations which met with the platers.

These organizations are the International Fellowship Club and the Metal Finishers' Equipment and Materials Association.

FRED BUESCHER
3rd Vice-President, Metal Finishers' Equipment and Materials Association

LESTER COPE
Secretary, Toledo Branch, American Electro-Platers' Society.

ASSEMBLED PLATERS AND VISITORS AT TOLEDO CONVENTION

E. W. HEIL
2nd Vice President, American Electro-Platers' Society

C. KOCOUR
1st Vice President, Metal Finishers' Equipment and Materials Association

H. E. BOARDMAN
2nd Vice President, Metal Finishers' Equipment and Materials Association

T. J. DONNELLY, JR.
Secretary-Treasurer, Metal Finishers' Equipment and Materials Association

WILLIAM SCHNEIDER
Secretary-Treasurer, International Fellowship Club

FRANK J. CLARK
Vice President, International Fellowship Club

Foundry Trade Customs

The Ohio State Foundrymen have recently revised their uniform trade customs in accordance with recommendations of a committee formed for that purpose. Among these customs, which many Ohio foundrymen print on their quotation forms, are the following:

1. For estimating purposes, blueprints submitted must be marked with rough casting weight, if known, or an estimated weight upon which quotation will be based.

2. Patterns to be in condition to make castings of the quality and quantity required.

3. Correctness of patterns and core boxes to blueprints rests with customer.

4. If patterns require follow boards or boards for molding equipment, they must be furnished by customer. On patterns requiring stopping off or if skeleton patterns are furnished, an extra charge will be made. Repairs and changes in patterns by customer's order at expense of customer. Patterns to be painted in standard colors.

5. All patterns, core boxes and loose pieces thereof should be properly marked for identification.

6. All freight, drayage, boxing and crating on patterns to and from foundry at expense of customer.

7. Foundry not responsible for loss of or damage to patterns by fire or other casualties beyond its control.

8. Patterns not in use for a period of six months shall be subject to storage charges.

9. The foundry is responsible only to the extent of replacing castings rejected due to foundry defects, and such castings must be reported or returned to the maker within 90 days after shipment. The foundry is not responsible for labor charges, loss or damage caused by defective castings. In case of nonferrous castings the full weight of the original castings rejected must be accounted for or returned to the manufacturer.

10. Claims for error in weight or number must be made within five days after receipt of casting.

11. If the customer requires special production service to secure quick delivery, an extra charge shall be made.

12. No order shall be changed unless notice of revision is made in writing and received by foundry before the work is in process. In case work is in process, customers to be charged with any castings made and cost of cores or molds discarded due to change in patterns or core boxes.

13. Cancellation of orders is to be made only by mutual consent.

14. Unless otherwise agreed, quotations must be accepted and patterns furnished within 30 days from date of quotation.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1927 by THE METAL INDUSTRY PUBLISHING COMPANY

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year : : SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

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ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

Vol. 25 New York, August, 1927 No. 8

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EDITORIAL

STABILIZING BRASS MANUFACTURE

The recent acquisition of the Detroit Copper and Brass Rolling Mills by the Anaconda Copper Mining Company and the plan of operation of the Detroit plant by its subsidiary, the American Brass Company, marks a further expansion of the leading factor in the fabricated brass industry. It brings to mind the discussion at the time when the Anaconda Company bought the American Brass Company, as to whether this meant the end of the supremacy of the Naugatuck Valley in the brass industry. Some thought that it would be only a matter of time before Connecticut plants were dispersed throughout the country to take care of local needs. Others contended that Connecticut would always remain at the head.

Without incurring the dangers of long term predictions, it seems to be indicated at this time at least, that the Connecticut brass industry is in no danger of falling apart. No new mills of great size have been started elsewhere and the plans of the Anaconda Company seem to be expansion by purchase of existing plants rather than by building new ones. Local manufacturing districts are fairly comfortably supplied by their present sources and the over-expansion of the brass industry which took place during the war has prevented any very large new installations since that time.

If the need arises for large mills in the future in any given locality it is probable that this will be supplied by the placing of a mill in that district when it is required. It will be additional capacity for the industry rather than the subtraction of business from present sources of supply.

MARKETING ZINC-COATED SHEETS

A situation has arisen in the zinc industry which calls for attention from manufacturers in every metal line. C. L. Patterson, secretary of the Sheet Steel Trade Extent Committee, at the recent meeting of the American Zinc Institute in St. Louis, spoke on the problem of marketing the Master Brand of galvanized or zinced sheets. He described the work of his committee in extending the use of sheet steel, but the part of his address which was particularly important to metal users discussed the results of the effort in marketing the Master Brand, supposedly the highest grade of zinc-coated sheet.

It seems that jobbers offered considerable opposition to carrying this brand. Their objections were as follows:

1. The uses to which the sheets were to be put were never known in advance by the jobber and most generally not by the customer.

2. The light coatings now in use will generally stand most of the operations of bending and forming to which sheets are put, but for some operations even these light coatings are too heavy and peel or flake off. The heavy Master Brand coatings do not stand severe working.

Mr. Patterson stated that there was a tendency for these operations to become too difficult for the galvanizing to withstand not only because the bends were being made more closely but also because of the employment of automatic machinery which makes these bends very much more quickly, thus giving insufficient time for the flow of metal to occur. The jobbers seem to have at this time little or no demand for heavier coated sheets and knowing that these sheets will not be satisfactory for a number of purposes, object to the increased stocks which they will have to carry if they stock the Master Brand sheets.

As a result this whole campaign will have to be dropped or continued in a modified form.

It was recommended that measures be taken to remedy this condition and some of these measures are as follows:

1. The development of a ductile zinc coating on steel sheets, such that these coatings will not crack off in bending.

2. Means of preventing the blistering of paint on galvanized sheets.

Mr. Patterson's advice should be followed by zinc manufacturers with the least possible delay. It is, of course, impossible to know beforehand all the difficulties that will come up in a new project. Evidently here some obstacles were discovered which had not been foreseen. That is no reason, however, for giving up the fight. It means perhaps heavier burdens to bear for a while and more work to do; also more money to spend. But the object is eminently worth while and, to many minds, indispensable to the zinc industry. It is a worthy aim, also, the education of the public to the need for a high grade product, and should be pursued on until successful.

ROOM FOR IMPROVEMENT

There is a classic story of an early commissioner of patents who resigned because he was afraid that in a very short time he would have no job. So many patents were being applied for and issued that very soon all possible improvements and inventions would have been made, and there would be no more work for him to do.

Scientific progress resembles nothing more than widening of a circle. The circumference represents the unknown while the area inside the circle represents the known. Increasing the size of the circle increases the area and the body of knowledge; at the same time it increases the contact with the unknown and the possible opportunities for improvement.

This has been clearly exemplified in the progress of the metal working industries. Every new advance brings with it opportunities for further improvement. At one time common steel was the last word, as was also bronze. Now we have tool steel, nickel steel, high speed steel, stainless steel, manganese bronze, leaded brass, aluminum bronze, bearing metals, die casting metals, Monel metal, and last, but far from least, a host of aluminum alloys.

The impetus to the search for new alloys has been supplied by the need for greater strength, less weight and corrosion resistance.

Industrial machinery demands great strength, transportation equipment demand strength and lightness to economize on power expended. The airplane is probably the best example of this need. Chemical industries and materials exposed to the atmosphere call for resistance to corrosion.

Early investigators perhaps hoped for the one perfect metal or alloy. Now this is known to be impossible. There is no one material or mixture which will be best under all conditions. Specific problems call for special answers and different corrosive agents demand varied corrosion resistants.

Electro-plating, japanning and lacquering have also joined the fight against corrosion, the most important recent example being the development of chromium plating; but we have of course, the standard processes of zinc coating, rust proofing, cadmium and nickel plating.

It seems to be a race between steel and metals in which the elements to be taken into consideration are performance, ease of manufacture, cost, and a host of other factors.

The steel industry has awakened to the fact that it must move fast to keep up with the extraordinary progress made in metals, and it is not slow to act. But non-ferrous metals will not be left behind, and the result will be that both sides will win, in the improvement of their products and the consequent benefit to humanity.

TESTING MATERIALS SOCIETY

The last meeting of the American Society for Testing Materials marked the 25th anniversary of its incorporation. At this time it is certainly in order briefly to go over the progress it has made.

Investigations relating primarily to the determination of properties and tests of materials without immediate regard to the problems of standardization are being carried on side by side with studies, the primary purpose of which is to furnish information which will aid in the formulation of suitable standards. The work of hundreds of members on the committees of the Society is mainly responsible for the progress. The Society has taken definite steps toward the participation in the International Congress for Testing Materials at Amsterdam, Holland. An official delegation will attend and a number of papers will be presented by Americans.

Concerning the extent to which industrial and trade associations are participating in the standards work of the Society, investigation has shown that 67 technical, industrial and trade associations hold membership in the Society and 55 are represented either directly or indirectly upon its committees. In addition, 53 associations, not members of the Society, are co-operating in its standardization work through various committees.

During the past year, as a result of the active work of the committees of the Society, 48 new tentative standards were accepted and 95 existing tentative standards were advanced to standard, 64 existing standards were revised, 6 tentative standards and 8 standards were withdrawn.

At the present time there are 380 standards of the Society and 250 tentative standards.

Considerable attention is being devoted and will continue to be devoted to corrosion; also to the effect of high temperature upon the properties of metals, testing and testing apparatus, x-rays, and other new tools of the testing research laboratory.

Manufacturers are coming more and more to buy on specification. One of the most important sources of specifications for engineering materials is the Society for Testing Materials, and its work should be followed closely.

METAL CONSUMPTION

The figures for American consumption of metals have recently been published by the American Bureau of Metal Statistics. According to this Bureau the use of lead in the United States increased. In 1926, 15.35 pounds per person of population were consumed as against 14.74 pounds in 1925. The principal item of increase was in storage batteries, cable coverings and building construction. Pigments decreased slightly, about 3%. Lithopone, on the other hand, a zinc pigment constituent, increased about 10%, but zinc white and leaded zinc also decreased. Storage batteries used 190,000 tons of lead and antimony in 1926 compared with 180,000 tons in 1925. Ammunition used 32,000 tons in 1926 and 31,500 in 1925. Lead in terne metal amounted to about 4,050 tons in 1926 and about 4,550 tons in 1925. Automobiles used 16,700 tons in 1926 and only 12,800 tons in 1925, aside from storage batteries.

A total of 16,000 tons of tin went into automobiles compared with 15,000 tons in 1925; 12,400 tons in 1924; 13,300 tons in 1923; 9,500 tons in 1922, and 5,700 tons in 1921. Other metals which went into automobiles are approximately as follows:

	1926	1925
Copper	102,800	106,400
Zinc	21,300	21,200
Tin	16,000	15,000
Lead	16,700	12,800
Aluminum	24,300	31,100

In a general way the consumption of metals in 1926 was about the same as in 1925, leaning perhaps slightly toward a decrease but remaining near the highest levels.

ELECTRO-PLATERS' BANQUETS

A condition in the American Electro-Platers' Society which has been growing from year to year, has been brought to our attention forcibly during the past few months. It was startlingly evident at the annual banquet of the New York Branch, and even at this date it is not out of place to comment on it. From the point of view of the numbers who attended, this banquet was undoubtedly a success. Upon closer inspection, however, it was far from perfect.

The annual banquet of this branch has always been looked forward to with almost as much interest as the annual convention, as it is attended by a large number of visitors from the metropolitan district and other branches. This year, based on previous records of attendance, the banquet committee made reservations for 450 people, more than had ever attended before. When they came to sit down, it was found that places were needed for 575, and if it had not been for the disagreeable weather there would have been many more.

The New York Branch takes pride in the smoothness with which it runs its banquets and feels that something should be done to prevent a recurrence of this circumstance. It was not a question of excessive numbers, but mainly the lack of adequate information beforehand from the members and their guests who expected to attend.

We would suggest that, hereafter, a definite date be set after which applications will not be accepted, and that this date be adhered to. It may be that it would be wiser to set a limit on the number of guests to be admitted. This is perhaps open to some difference of opinion, but there is no question about the need for accurate advance information and definite reservations. Undoubtedly something will be done along these lines for next year's affair, and other branches troubled in the same way should take similar steps.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

A GROUP OF FRIENDS

To the Editor of The Metal Industry:

I subscribe to several of the leading trade journals. They are all very useful in their way, but I get more real practical data from The Metal Industry than the rest put together. I have built up a most efficient nickel plating department through an inspiration I received from reading The Metal Industry.

Frank B. Collins.

To the Editor of The Metal Industry:

Enclosed please find suscription for one year. Sorry that this matter has not been previously attended to, and wish to state that your paper is too valuable to discontinue.

Newark, N. J.
July 15, 1927. John Robinson.

To the Editor of The Metal Industry:

Your magazine has been of great benefit to me with its various articles on metals, as this is a new line to us. The plating and polishing work we are now doing, but expect to branch out into other phases of the metal work before long.

Dixon, Ill.
July 15, 1927. William B. Rusch.

NEW BOOKS

Titanium. By William M. Thornton, Jr. Published by the Chemical Catalog Company, Inc. Size 6 x 9, 262 pages. Price $5.00.

Titanium is one of the series of scientific and technologic monographs published for the American Chemical Society. Several of these books have already been reviewed in our columns and a number of others are in process of preparation.

The book goes into the subject from the discovery and occurrence in nature through industrial applications and compounds, General chemistry of titanium is also described. Alloys are taken up briefly, most of the space allotted being devoted to ferro-titanium. Cupro-titanium, mangano-titanium, and titanium bearing aluminum alloys are also mentioned.

The major portion of the book is devoted to the detection and estimation of titanium in its various associations and a voluminous bibliography is appended.

Aluminum Bronze Powder and Aluminum Paint. By Junius D. Edwards. Published by the Chemical Catalog Company. Size 6 x 9, 104 pages. Price $3.00.

Mr. Edwards, who is assistant director of research of the Aluminum Company of America, has had considerable experience in the manufacture of aluminum bronze powders and paints. In the laboratories of the Aluminum Company a great deal of work has been done in developing these products. The book discusses and describes the manufacture of aluminum bronze powder, its properties and methods of examination.

Aluminum paint is taken up and the following points described: Composition, Specification and Testing; Special Properties and Uses; Application, Aluminum Paint on Wood, Use of Aluminum Paint and Aluminum Bronze Powder in the Arts.

Employment Psychology. By Harold E. Burtt. Published by Houghton Mifflin Company. Size 5½ x 8, 568 pages. Price $4.00.

Books on this topic have been reviewed before in these columns and while they are of general rather than specific interest to metal plants, they are valuable because the problem of employment is present in every industrial operation. Professor Burtt offers suggestions for the practical solution of business men's problems in this field. The works manager and employment manager will also find it a useful reference.

Some of the topics of special interest covered by this book are as follows: Psychology Gold Bricks; the History of Vocational Psychology; Types of Mental Tests; Metal Test Technique; The Subjects Used in Evaluating Costs; Special Capacity Tests; Intelligence and Vocational Aptitude; Rating Scales; Trade Tests; Job Analysis.

Fatigue of Metals. By H. F. Moore and J. B. Kommers. Published by McGraw-Hill Book Company, Inc., New York. Size 6 x 9, 326 pages. Price $4.00.

This book is a summary of the more important experimental facts concerning the strength of metals under repeated stress, a brief review of the more important of the current theories of fatigue of metals, and a description of apparatus and methods used in making an experimental study of the fatigue of metals. The authors have been for some time in charge of the Joint Investigation of the Fatigue of Metals in which the American Society for Testing Materials and other organizations have joined.

There has been increasing demand for information on the subject of fatigue of material and the book is a most valuable and authoritative collection of information, not only compiled but original in character, due to the outstanding work of the authors. Every testing engineer and designing engineer should have a copy.

Some of the chapter headings are as follows: Stress and Strain in Metals; The Accuracy of the Ordinary Concepts of Elastic Action; Slip, Overstrain and Hysteresis; Fracture Under Repeated Stress; Testing Machines and Specimens for Fatigue Tests of Metals; Characteristic Results for Fatigue Tests; The Effect of Range of Stress on Fatigue Strength; "Stress Raisers" and Their Effect on Fatigue Strength; Stress and Corrosion; Fatigue Failure Under Service Conditions.

TECHNICAL PUBLICATIONS

Physico-Chemical Principles in Electro-Metallurgical Research. By Colin G. Fink, associate professor of Chemical Engineering, Columbia University.

The author emphasizes the great importance in the application of physico-chemical methods to metallurgical research. The importance of the surface film reactions has been evident in many of our researches. The commercial success of the insoluble anode was due to a surface film with high oxidizing powers. In the case of the copper-clad leading-in wire, used in place of platinum as a seal in glass, the immediate solution of the problem was due to the valuable properties of the copper surface film in contact with the glass. In the electrodeposition of chromium and chromium alloys, it was the control of the cathode surface film of hydrogen that transformed a laboratory stunt into an industrial process. In the ductilization of tungsten, it was the study and control of the surface film of the individual tungsten crystals that indicated the proper path of solution.

The author also stresses the importance of studying those properties and characteristics of the material under investigation that seem to have no direct bearing on the solution. Many valuable suggestions can be traced right back to so-called "irrelevant data."

GOVERNMENT PUBLICATIONS

Acid Processes for the Extraction of Alumina. Bureau of Mines Bulletin 267. Washington, D. C.

Smelting and Refining (Non-ferrous Metals). Census of Manufactures: 1925. Bureau of the Census, Washington, D. C.

The Chromium Situation from a Domestic Standpoint. By J. W. Furness. Bureau of Mines, Circular No. 6038. Washington, D. C.

Precipitation of Lead and Copper from Solution on Sponge Iron. By Oldright, Keyes, Miller and Sloan. Bureau of Mines Report of Investigations, Serial No. 212. Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

BLUE ON STEEL

Q.—Will you please give me a formula for bluing on steel. This is a production job and I would like to do it in a dip. At present am using hyposulphite of soda and sugar of lead. If you have anything better as to time and wearing quality, would appreciate it very much.

A.—The method you now use in bluing steel with sodium hyposulphite and lead acetate is the most simple process you can use. If your product will stand a slight increase in cost of production, you could use the heat method with far better results and a more permanent product. The method is to melt equal parts of sodium nitrate and sodium nitrite in a cast steel or iron pot to 700 deg. F. The articles to be blued should be as bright as possible and perfectly dry before immersing in the bluing solution.

It is best to use a perforated sheet steel ladle with plenty of holes and a long handle with this type of solution so that the articles can be moved rapidly while bluing to produce a uniform blue color. Furthermore, less material is lost by drag-out with plenty of holes in the ladle. As soon as the blue is produced, quench in cold water; use a steel wire basket to hold the articles as they are immersed in the water. Finally, dry the articles out by the aid of boiling water and sawdust. A splendid blue color will result; if you desire to protect the blue surface from rust, then tumble them in maplewood sawdust, moistened with boiled linseed oil or any veto rust oil. Sodium nitrate and nitrite can be purchased in 200 lb. bags at a low price.—C. H. P. Problem 3,663.

BRONZE FINISH

Q.—I want to put a bronze-looking finish on a cheap metal casting. It occurs to me that turning the surface of an iron casting into FeS_2 might be just about what I want, if I knew how.

Is there some way to turn the surface of cast iron into iron sulphide? Or any way to produce an inexpensive casting with a good bronze-like finish?

A.—There are two methods that you might use to advantage in producing a bronze looking finish suitable for the cheap gray iron article you have in mind. The first method would be to cleanse the article by tumbling in a solution consisting of water 1 gallon; soda ash 58% 3 ozs.; sodium cyanide 96-98% ½ oz. The tumbling of the article in this solution at 12 RPM will give a clean surface in 15 to 30 minutes. Then remove the article and wash in cold water and immerse in the following solution for a few moments. Water 1 gallon; hyposulphite of soda 8 ozs.; lead acetate 4 ozs.; soda ash 58% ¼ oz. Temperature 180 deg. F. The resulting color will be either a dark blue or a gun metal blue. Wash the articles in cold and boiling water to dry them out. Lacquer with a water dip lacquer or a thin coat of linseed oil will preserve the finish. The second method is to cleanse as outlined; then immerse in the following solution: Water 1 gallon; sulphuric acid 60°, 8 ozs.; dry copper carbonate 4 ozs. To prepare the solution, add the acid to the water then add the copper carbonate very slowly to avoid excessive evolution of carbonic acid gas, due to interaction of the acid and the carbonate. Operate the solution at 80 deg. F. The immersed gray iron articles should be immersed in the copper solution for a moment until uniformly coated with copper.

Remove, wash thoroughly in cold water, immerse in a solution of polysulphide on the following basis: Water 1 gallon; polysulphide ¼ oz.; water ammonia 26° ⅛ oz. Temp. 180 deg. F. A moment's immersion in the above solution of the copperized articles will result in a copper sulphite deposit which may be red or brown, or black as desired. Finally, wash and dry out thoroughly, then oil or lacquer as desired.—C. H. P. Problem 3,664.

CLEANING SILVERWARE

Q.—Could you give me a substitute to remove tarnish from silverware as you know that cyanide of potassium is very dangerous to use.

A.—The tarnish that develops on articles made of Sterling or silver plate is a silver sulphide. This sulphide varies from the yellow to black. Being a metal sulphide it is only directly soluble in a solution of sodium or potassium cyanide. From your inquiry, you have used these factors but due to very poisonous nature of them you desire to dispense with their use. The only remaining methods would be to use a very concentrated solution of hyposulphite of soda in water. Try from 1 to 2 lbs. per gallon of water. Use hot water to dissolve the salt. Apply with a cloth or by immersing the articles in the solution. The next method is to reduce the silver sulphide by an electrolytic reducing method. This is the preparation that is sold in department stores.

To produce a unit all that is necessary is to corrugate a thin sheet of aluminum or zinc similar to a wash board so that it will be a minimum of 6" long and 4" wide. In an enameled pan, place the aluminum or zinc corrugated sheet; to every gallon of water heated to 180 deg. F. add about 4 ozs. bicarbonate of soda. Some times equal proportions of soda ash and common salt are used. The bicarbonate of soda no doubt gives the best results. The silver articles to be cleansed must always be placed in contact with the aluminum or zinc sheet.—C. H. P. Problem 3,665.

CLEANING SOLDERED TUBES

Q.—We are manufacturing a product which is composed of two parts, one part is a copper tube soldered to the other part which is a brass flange. After the soldering operation this part is very dirty and must be washed to prevent further corrosion and in the washing process we discolor the soldered joint. We would like your opinion of a proper solution to use for washing work of this kind which will not discolor the soldered joint and also keep the brass and copper parts bright. This solution must be something that will not attack very thin copper or brass as the material is only 6/1000" thick.

A.—We suggest for your purpose a solution consisting of water 1 gallon: trisodium phosphate 3 ozs.; sodium cyanide 96-98% ⅓ oz. It is our opinion that this solution will not affect the soldered joints and blacken them as now results from your present cleansing methods. The brass or copper parts will remain bright. From the solution the articles should be washed in cold and boiling waters and dried out in sawdust as usual. You can operate the above solution at any temperature up to boiling point with excellent results. We should be pleased to hear the results you obtain.—C. H. P. Problem 3,666.

DEPOSITING IRON

Q.—Kindly let me have an iron formula solution for the upbuilding of iron deposits on steel shafting.

A.—One of the largest electrical firms in the United States uses the following formula for iron solution to build up worn parts of steel shafting, etc. Water 1 gallon; double salts of iron and ammonium sulphate 48 ozs. Temperature 180-200 deg. F. Voltage 4 to 5. Anodes of soft mild steel, which should be circular in shape and so arranged that the distance from the shaft, etc., to be iron plated, will be about 6" from the anode. The best results are obtained when the shaft is rotated in the solution at about 12 revolutions per minute. This motion prevents occlusion of hydrogen to a great extent in the deposition. The deposit of iron can be afterward finished to a surface finish and heat-treated if so desired.—C. H. P. Problem 3,667.

GALVANOPLASTY

Q.—The writer wishes to make experiments in hollow objects, and for this would like to get the names of makers of materials which can be moulded either by hand or otherwise, on which copper or brass, etc., may be coated, after which the material may be melted from the form, simply leaving the form itself with the inside hollow.

A.—Your proposition is an old one. Gutta percha molds that become fluid enough in boiling hot water to remove them from the copper deposited upon the mold, have been in use for many years. We suggest that you read Langbein's Electro Deposition of Metals, and also Electroplating and Electroforming by Blum and Hogaboom. Both of these works cover galvanoplasty.

In producing products such as you have in mind, you would require a mold to cast the gutta percha matrix with all the detail required. After the gutta percha mold is hard, it can then be treated with a thin coat of alcoholic shellac while tacky, then a mixture of platers' copper bronze powder and finest Ceylon graphite must be carefully brushed into the shellac. When dry the excess must be removed by immersion in water and agitated. After carefully wiring up with soft copper wire, the molds are ready to plate in a regular acid copper solution.

Water	1 gallon
Copper sulphate	28 ozs.
Sulphuric acid	4 ozs.
Yellow dextrin	⅛ oz.

Anodes, soft sheet copper. Voltage 1 to 2. Temperature 75 to 80 deg. F., amperage 5 to 10 per sq. ft. of surface area. After copper plating the mold to the required thickness of copper, remove the mold by immersing in boiling hot water. Some operators use Ceylon graphite only and apply direct to the gutta percha mold by brushing in thoroughly.—C. H. P. Problem 3,668.

GOLD PLATING

Q.—I desire to obtain an up-to-date formula for gold plating and if you could possibly furnish me with same, I would be greatly obliged.

A.—The following formula will give you an excellent gold finish even with a very thin deposit:

Water	1 gallon
Sodium cyanide	1⅓ oz.
Sodium gold cyanide	⅓ oz.
Bisulphite of soda	¼ oz.
Caustic potash	⅛ oz.

For brightening purposes a little phosphate of soda may be added; ½ oz. per gallon when required will be ample. Voltage 3 to 4. Temperature, 160 deg. F. Anodes, fine gold, sheet nickel (rolled) or hard sheet steel.

Time of plating from 10 seconds upwards. Add sodium cyanide as required, not more than ⅛ oz. per gallon at one time. Always keep the solution line permanent with clean, cold water. Make addtions as required afterwards.—C. H. P. Problem 3,669.

POLISHING ALUMINUM

Q.—How can I polish aluminum?

A.—Polishing of sheet aluminum or articles made of the metal, is readily accomplished by usual methods of procedure as in polishing brass or copper. Aluminum, however, melts at a lower temperature than brass so burns more easily in polishing than brass.

Kerosene is the factor to be used in polishing aluminum. It should be applied to the buffing wheel when cutting down the surface with Tripoli or flour emery paste and also when final coloring is applied with white diamond or similar finishing compounds. Prepare a swab from an old section of a buff rolled up and apply a little to the buffs. Kerosene oil is a splendid lubricant for the purpose. It prevents the aluminum coating the buffs which results in a scratched finish. It also acts as a cleansing medium, resulting in a bright lustre on the finished aluminum surface.—C. H. P. Problem 3,670.

IMITATION PLATINUM

Q.—Please give me a solution for imitation platinum on white gold?

A.—Many jewelers are now chromium plating their white gold jewelry to prevent atmospheric oxidation due to sulphur dioxide fumes. The chromium solution consists of: Water, 1 gallon; Chromic acid, 16 ozs.; chromic sulphate, 1 oz.; boracic acid, ¾ ozs.; chromate of iron, 1 oz.; temperature, 115 deg. F.; voltage, 6-12 volts; amperage per sq. ft. of surface area, 150-300. Anodes, chrome nickel steel, circular in form, entirely to surround the articles. Time of plating, 3 to 5 minutes. Tin solutions are also used.

Tin solution:

Water, temp. 180° F.	1 gallon
Caustic potash	2 ozs.
Tin chloride	¼ oz.
Powdered rosin	1/64 oz.

Anodes, sheet, steel; voltage, 3 to 4.

Cadmium can also be used to advantage.

Cadmium solution:

Water	1 gallon
Sodium cyanide, 96-98%	6 ozs.
Cadmium oxide	1 oz.
Caustic potash	½ oz.
Black New Orleans Molasses	¼ oz.

Temperature, 120° F.; voltage, 4 to 5; anodes, sheet steel; time of flash deposit, 10 to 20 seconds. All products to be covered with protecting deposits must be highly polished and perfectly clean before plating.—C. H. P. Problem 3,671.

ROSE GOLD FINISH

Q.—How can I produce a rose gold finish on jewelry?

A.—To produce a rose gold finish on jewelry, the usual gold solution is used. See "Platers' Wrinkles." The solution should be heated to 180 deg. F., and a voltage of 8 to 10 be used for a moment. This will result in a gold resembling copper, which will have a light smut. Then remove and wash in water. Rub down the high lights with bicarbonate of soda and plate in a gold solution of the same composition at 140 deg. F., and 3 volts. The second deposit will result in a yellow gold on the high lights and a rose gold in the backgrounds.

In cheap rose gold finishes, the articles are first plated in a copper cyanide or an acid copper solution for a few minutes, then rubbed down with bicarbonate of soda, immersed in a hot silver dip, consisting of: Water, 1 gallon; sodium cyanide, 1 oz.; silver cyanide, ⅛ oz., at 160 deg. F. Finally, gold plate for finish as outlined above.—C. H. P. Problem 3,672.

WHITE NICKEL

Q.—I am having difficulty in plating nickel on small nuts, of which I enclose samples. These samples were in solution 4 hours. I am running them in a barrel with solution 30 deg. B. at 10 volts, but as you will note, they do not come out well. I would like a brighter and whiter color on them. I am using your solution as per "Platers' Wrinkles," for heavy, white deposits on iron and steel and have plenty of anodes. Other small castings come out well.

A.—We suggest the following procedure: Tumble the steel nuts to a bright finish in a solution consisting of: Water, 1 gallon; soda ash, 58%, 4 ozs.; sodium cyanide, 96-98%, ½ oz. The oils from tapping operations should be removed first, by immersing in a strong, hot, alkaline cleaner. If this is done before tumbling the nuts in the above solution, then after tumbling them they may be washed only in water and plated direct without further cleansing.

To produce a whiter nickel, add to your present nickel solution ¼ oz., 65% acetic acid, 1 oz. sal-ammoniac, and 4 ozs. Epsom salts per gallon of solution. These additions should result in a whiter and brighter nickel deposit. The addition of 1 oz. or more ammonium chloride or nickel chloride per gallon of solution will prove beneficial. It will increase the conductivity of the nickel solution and produce a softer deposit. Some platers increase the Epsom salt content up to 6 or 8 ozs. per gallon, and find that less hydrogen is deposited, resulting in a softer deposit. But temperature after all is a great factor in obtaining satisfactory results in all solutions.—C. H. P. Problem 3,673.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,630,361. May 31, 1927. **Apparatus for Reclaiming Metals.** Theron D. Stay and Charles O. Tessier, Cleveland, Ohio, assignors, by mesne assignments, to Aluminum Company of America, Pittsburgh, Pa.

An apparatus for reclaiming light readily oxidizable metals comprising in combination, a melting furnace, molten metal agitating means in the furnace, means for actuating said agitating means, means for feeding scrap metal into the furnace in a substantially continuous stream, and means for concentrating the dross on the surface of the molten metal.

1,630,507. May 31, 1927. **Process of coating Materials Having an Iron or Steel Base.** Leo A. Wynd and Julian L. Schueler, Peoria, Ill.

A process for applying smooth zinc coatings to iron or steel material, independent of wiping, which consists in subjecting the material to an activated cleaning prior to its entrance to a coating bath, passing the material through the coating bath, the entrance of the material and the exit of the material from the coating bath being through substantially clean zinc surface.

1,630,508. May 31, 1927. **Galvanizing Apparatus.** Leo. A. Wynd and Julian L. Schueler, Peoria, Ill.

In a galvanizing apparatus, in combination, a furnace provided with a plurality of longitudinally disposed and spaced heating chambers, a pan for each chamber removably supported therein, individual heating means for each pan, means for dividing the said pans into compartments at each end, and means located above each end of the furnace adapted to supply a flux to the end compartments of said pans to provide a clean zinc system for the ingress and egress of articles through said pans.

1,630,688. May 31, 1927. **Chromium-Plated Carbon Article.** Frederick M. Becket, New York, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

A chromium-plated graphite chill.

1,630,771. May 31, 1927. **Process of Soldering Articles.** Eugen Thoma, Pforzheim, Germany.

The process of soldering articles having connected links which consists in depositing, between the adjoining ends of the links, by electrolytic action, material capable of having a soldering effect with respect to the metal of which the links are made and subsequently softening the material to solder the link ends together.

1,630,784. May 31, 1927. **Annealing or Heating Furnace.** James R. Coe, Waterbury, Conn., assignor to the American Brass Company, Waterbury, Conn.

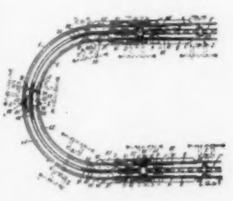
In a heating furnace, a heating chamber, a carrier in said chamber mounted to revolve in a vertical plane and having means at its periphery for carrying holders for the material to be heated, and mechanical means for inserting the holders in and removing them from the carrier.

1,630,999. May 31, 1927. **Wrought-Metal Article.** William H. Bassett, Jr., Ansonia, Conn., assignor to The American Brass Company, Waterbury, Conn.

A new wrought metal article composed of an alloy consisting essentally of copper and tin with aluminum, approximately in the proportions copper 95.5%, tin 2%, aluminum 2.5%, the aluminum being in excess of the tin.

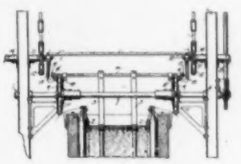
1,631,124. June 7, 1927. **Conveyor.** Wesley F. Hall, Matawan, N. J., assignor to The Hanson & Van Winkle Company, Newark, N. J.

In a conveyor of the class described, the combination comprising straight longitudinal conveyers, propelling means therefor, curved end conveyers, and propelling means therefor, the latter adapted to drive the end conveyers at a greater speed than the longitudinal conveyers.

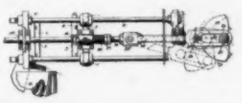


1,631,199. June 7, 1927. **Electroplating Machine.** Wesley F. Hall, Matawan, N. J., assignor to The Hanson & Van Winkle Company, Newark, N. J.

In combination with an electroplating tank, a horizontal conveyer comprising horizontal conveyer chains located on each side of the tank, a bar resting transversely on said horizontal conveyer chains for in said tank and a vertical conveyor situated above said horizontal conconveyor.



1,631,686. June 7, 1927. **Die-Casting Machine.** Torbjorn Conrad Korsmo, Madison, Wis., assignor to Madison-Kipp Corporation, Madison, Wis.

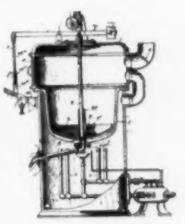


In a die casting machine, the combination of a pair of co-operating die parts adapted to form a mold, means for moving one of said die parts towards and from the other for closing and opening the mold, and means for causing said movable die part to dwell in its closed position and to begin its opening movement and end its closing movement abruptly with sudden transition to or from approximately its maximum speed of motion.

1,631,930. June 7, 1927. **Method of Improving Aluminum Alloys.** Vincenz Fuss, Lautawerk, Germany, assignor to Vereinigte Aluminumwerke A. G., Lautawerk, Germany.

The process of treating aluminum alloys consisting in producing an ingot of aluminum alloys with substantially four per cent of copper and two percent of silicon, subjecting the same to pressure to reduce it to the desired thickness, heating the same to the temperature of substantially 500 degrees C. for the period of about three hours, cooling the same, and then maintaining the same at a temperature of about 90 to 100 degrees C. for the period of about 48 hours.

1,632,366. June 14, 1927. **Melting Furnace.** William H. Chenowith and George C. Schimpf, Curtis Bay, Md., assignors to Harry D. Harvey, Baltimore, Md.



In a melting furnace, a casing, a melting pot within the casing and having an outlet opening in its base and a valve seat in said opening, a valve stem extending downward through the pot and having a valve at its lower end adapted to fit on said seat when the stem is lowered, a lever fulcrumed on the top of the furnace and having a pivotal connection with said stem, a hand lever pivoted to one side of the furnace, a link connecting said levers, said link comprising two parts and a yielding connection between said parts, and means for locking the hand lever when the valve is seated.

1,632,604. June 14, 1927. **Bearing Metal.** Paul Kemp and Theodor Kittl, Vienna, Austria. Bearing metals consisting of 65-77% lead, 3-14% tin, 10-27% antimony and 0.7 to 2.5% arsenic.

1,632,704. June 14, 1927. **Castings Having Chromium Alloy Surface.** Charles B. Jacobs, Wilmington, Del., assignor, by mesne assignments to Electro Metallurgical Company, a Corporation of West Virginia.

The method of making a ferrous metal casting having a chromium alloy surface layer that is strongly resistant to oxidation, which comprises coating a surface in the mold in which the casting is to be formed to a depth of from about one-eighth to one-quarter of an inch with a mixture composed of metallic particles comprising chromium and a binder for said particles, hardening the resulting coating, and then introducing into said mold molten ferrous metal at a pouring temperature of from about 2,650 to 2,900° F., the size and disposition of said metallic particles in the coating being such as to permit ready penetration therebetween by the molten metal and solution of said particles by said molten metal.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW MOTOR-GENERATOR SET

The Electric Products Company, Cleveland, Ohio, has within the past year added to its line of low voltage motor-generator sets a complete range of sizes of electro-plating motor-generators, designed to meet the very latest needs of the electro-plating industry.

A considerable number of their electro-plating machines have been in service for some time in connection with the deposit of chromium, cadmium, copper, nickel, and zinc, and the Electric Products Company claims for them an unusual degree of efficiency under all the varying conditions of plating for which they are used.

In chromium plating, it is necessary that the generator function perfectly over a wide range of voltages and the E-P generator is said to meet this demand to the fullest extent. To insure perfect commutation under the wide variety of load and voltage conditions encountered in chromium plating, E-P generators are supplied with as many inter-poles as main poles. The generators are shunt or compound wound, the percentage of compounding being governed by the conditions of service.

The brush-holders are of the latest design reaction type, of sufficient size to insure low current density. The generator field ring is made of rolled steel, electrically welded, insuring uniform distribution of flux and guaranteeing the satisfactory commutator design.

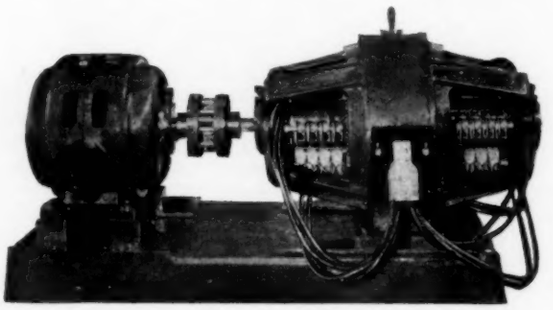
With their electro-plating motor-generators, the Electric Products Company furnish panels consisting of electrical slate mounted on suitable supporting frame, equipped with voltmeter, ammeter, field rheostat, and a positive and unique overload protection feature. If the current at any time exceeds a pre-determined safe value, the voltage of the generator is automatically reduced to that safe value by means of the overload protection feature.

The E-P electro-plating machines are built either open or fully enclosed, the latter type being advisable where the generator is so located that it is likely to be splashed with the plating solution.

The manufacturers of E-P electro-plating motor-generators recommend that the machine be installed as near to the plating tanks as possible. In this way, bus bars are eliminated, as well as the electrical losses incident to the older method of installing the generators at some distance from the tanks.

Also, by mounting the panel near the plating tanks, it is possible by means of the field rheostat on the panel to regulate the generator voltage to the exact voltage required on the tanks. With the equipment installed in this way, the operator acquires the habit of watching the voltage rather than the current, and this is particularly important in chromium plating.

For the past fifteen years, the Electric Products Company has been manufacturing Wotten motor-generators, used very widely in connection with battery motive power and special installations, and their line is now further broadened by the addition of the E-P electro-plating motor-generators.

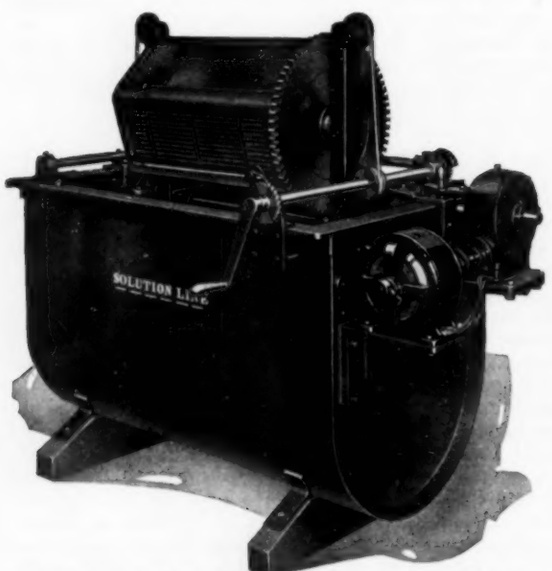


ELECTRIC PRODUCTS LOW VOLTAGE MOTOR GENERATOR SET

NEW PLATING BARREL

At the Platers' Convention in Toledo, Frederic B. Stevens, Inc., of Detroit, Michigan, exhibited a new type of plating barrel, which has several unique features in its construction.

For years there has been a real demand from the plating industry for a mechanical plating barrel in which a warm or a hot solution could be used without having any bad effects on the machine. The various accepted materials for plating barrel construction, such as Micarta, Bakelite, Mahogany, etc., while most excellent and giving good service in every other way, would not stand up under heat, nor was their life very long when used in solutions very high in cyanide contents. It was to meet this condition that this machine was developed.



NATIONAL STEEL PRODUCTS PLATING BARREL

The cylinder or barrel proper, that is the frame work, is made entirely of heavy steel plate, both the heads and the crossmembers. Then the entire barrel, that is the heads and the cross pieces, are entirely covered by the American Hard Rubber process, known as the "ACE" hard rubber process, which provides for a covering of soft rubber on the steel itself and then a heavy covering of hard rubber is applied and vulcanized on top of the soft rubber.

The soft rubber acts as a cushion against jars and prevents breakage and also, what is most important, provides for the unequal expansion and contraction between the steel and the hard rubber, so there is no consequent danger of cracking.

This coating of soft and hard rubber inside of the barrel is 3/8" thick, which allows ample thickness for abrasive wear and insures extremely long life. The panels themselves, which are readily removable and replaced at small expense are made entirely of hard rubber, with the cross sections 3/8" thick and further, as they are corrugated, are very strong and further eliminate the possibility of flat pieces lying and stacking against the side of the barrel as it revolves.

With this construction it is claimed to be utterly impossible for short circuits to develop in this barrel as is the common and usual occurrence in barrels made of any other material that has as yet been used.

The next feature of construction is the fact that a steel tank is used regardless of the solution that is intended to be used in the machine. In the case of nickel, silver or even cadmium, the inside of the tank is heavily coated with soft and hard rubber, just the same as the barrel and therefore, one may have a barrel

perfectly insulated, absolutely liquid tight in every way, and further proof against any short circuits.

Of course, when cyande copper or cyanide zinc solution is to be used, then the rubber coating on the inside of the tank is quite unnecessary.

Along with the other features indicated above, the tank can be provided at the buyer's option with steam coils, using either lead pipe, black iron pipe or brass coils, whichever may be specified and whichever may be suitable for the solutions that may be used.

While the cuts indicate that the method of driving this barrel is direct motor drive through a gear reduction unit, it is also possible to furnish the barrel with the ordinary belt drive, providing a pulley for that purpose and driving from a line shaft.

Summing up the claims for this machine, the manufacturers are offering a mechanical plating barrel, in which heated solutions may be used without any detrimental effect to the machine itself in any way, shape or form, with the commonly known advantage that the plating time can be cut in two when hot solutions and higher current densities are used.

Second, all dangers of short circuits are eliminated on account of the rubber covering used on this machine.

Third, with the all steel constructions of barrels, there is positively no danger of any warping of the machine itself.

Fourth, ample facilities are provided for in the machine to carry any amount of current that the customer might specify.

The machine is manufactured by the National Steel Products Company of Dayton, Ohio, and is offered for sale by Frederic B. Stevens, Inc., of Detroit, Mich.

CLEANER EXHIBIT

One of the interesting exhibits at the recent A. E. S. Convention in Toledo was that of the International Chemical Company, manufacturers of cleaners of Philadelphia, Pa.

A great many samples of metal products were shown, and in each case there was posted complete information relative to the cleaning and finishing of the product shown. Most of the interest centered around several samples of work which were cleaned and polished in one operation in tumbling barrels. Greasy steel stampings were placed in tumblers using 2½ ounces of Burnishing Compound No. 6 to the gallon of water. The work was tumbled for ¾ of an hour, then removed from the tumbler, rinsed, run through the regular dips, and into the plating tank without any further operation. The same Burnishing Compound No. 6 solution was used for two or three lots of work.

Among the many firms that kindly lent samples of work cleaned with International Cleaners were the following:

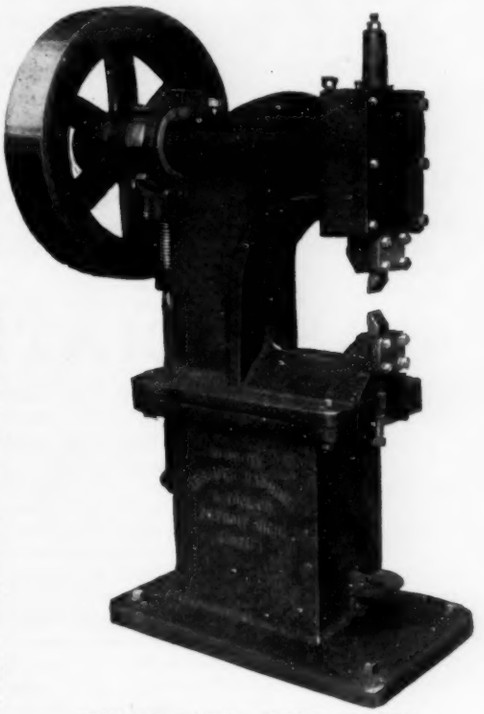
Eaton Axle and Spring Company, Cleveland, Ohio.
Fulton Manufacturing Company, Milwaukee, Wis.
Gerity, Whitaker Plating Company, Toledo, Ohio.
Kokomo Automotive Manufacturing Co., Kokomo, Ind.
Lockwood Manufacturing Company, South Norwalk, Conn.
National Screw and Manufacturing Co., Cleveland, Ohio.

POWER SPRUE CUTTER

This machine made by the Tessmer Machine & Tool Company, Detroit, Mich., is designed to cut castings from gates. It is very heavy, has large wearing surfaces, cutters will remain in line and make clean close cuts. It is fitted with a very simple clutch, the wearing parts of which are made of tool steel.

The crank shaft is made of 40 point Carbon Steel and connecting Link of Malleable Steel. This machine has a continuous trip pin attached and provided with large and long wearing friction shoes, preventing the shaft from making more than one revolution.

Model H will cut a piece equivalent to ¾ in. square common brass. Model I will cut up to 1¼ in. square brass.

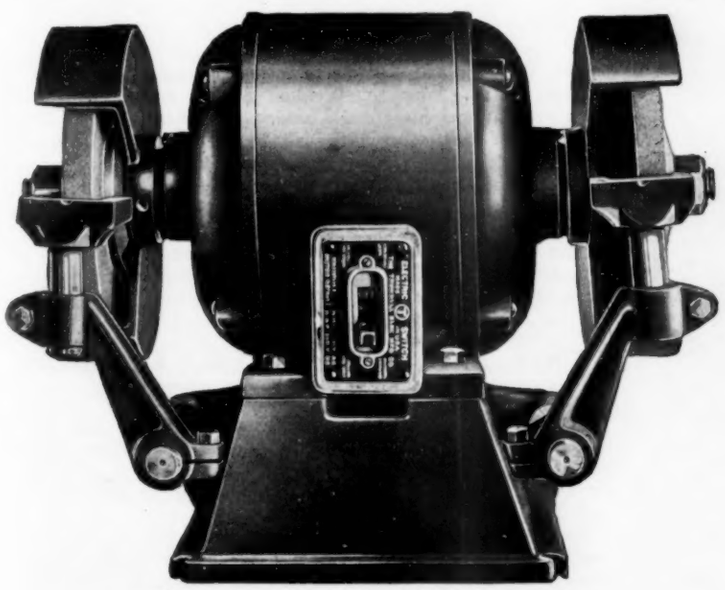


TESSMER POWER SPRUE CUTTER

WOOD POLISHING WHEEL

The Advance Wheel Manufacturing Company, Inc., Chicago and Detroit, is now in a position to accept orders on Advance wood polishing wheels which they are now manufacturing, having recently equipped their factory with modern machinery to manufacture this new Advance product.

A feature of the Advance wood polishing wheel is that it is made up with two flanges (one on each side of the wheel) instead of one flange. This additional flange permits the manufacturers to guarantee the wheel from warping. There is no extra charge for the additional flange.



EAGER "COMPO" GRINDER AND BUFFER

NEW GRINDER

The Eager Electric Company of Watertown, New York, has placed on the market a new grinder and buffer which bears the trade name "Compo." This grinder can be used in the manufacturing plant, finishing room, battery shop or garage.

It is said to be unusually powerful and can be equipped with two emery wheels 8" in diameter or with an emery wheel at one end and a buffing wheel or scratch brush at the other.

The motor is fully enclosed, either single or three phase being used. The ball bearings are in dust proof bearing chambers. The machine is equipped with a wheel guard and 3½" safety flanges to insure protection in case of wheel breakage.

The grinder is controlled by a toggle switch fully enclosed and of a very sturdy design. It is protected by a metal case, and cannot crack the porcelain as snap switches do.

Peck, Stow, Wilcox Company, Cleveland, Ohio.
Reflector & Illuminating Company, Chicago, Ill.
Stewart Die Casting & Manufacturing Company, Chicago, Ill.

EQUIPMENT AND SUPPLY CATALOGS

Look for the Diamond. Advance Wheel Manufacturing Company, Inc., Chicago, Ill.

The Vague of Chemical Analysis. Robert J. Anderson, Inc., Cincinnati, Ohio.

How to Get Suggestions from Employees. Policyholders Service Bureau, Metropolitan Life Insurance Company.

Adjustable Stencils for Marking Shipments, Etc. Charles K. Schweizer Company, St. Louis, Mo.

Plumrite Pipe. Bridgeport Brass Company, Bridgeport, Conn.

Rings for Chemical Tower Packing. Isolantite Company of America, Belleville, N. J.

Automatic Combustion Control for Boiler Furnaces. Gibson System. Leeds and Northrup Company, Philadelphia, Pa.

Mueller Brass Craftsman. Mueller Brass Company, Port Huron, Mich.

A Bit of History in the Oxyacetylene Industry. Air Reduction Sales Company, New York.

Cast Bronze Statuary. American Art Bronze Foundry, Inc., Chicago, Ill.

Jeter's Standard Skylights. A. H. Jeter & Company, Inc., Long Island City, N. Y.

Alemite Industrial Lubricator. Alemite Lubricator Company, (all principal cities).

Nickel Alloy Steel Products, 2nd edition. The International Nickel Company, New York.

The "Lindy" Tire Repairer, for vulcanizing, brazing, welding, etc. Stow Manufacturing Company, Binghamton, N. Y.

Venturafin No. 2. American Blower Company, Detroit, Mich. Unit heater for installation in buildings and rooms where small sizes are required.

General Electric Publications. Magnetic Switch; Semi-automatic Reduced Voltage Starters; Direct Heat Electric Furnaces; Automatic Reduced Voltage Starters; Cartridge Units; Metal Melting Pots; Mechanical Drive Turbines; Push-and-Pull Button Control Switches; Turbines, 2000 to 6000 Kw.; Duplex Controllers; Direct-current Motors for Steel Mill Main Roll Drives. General Electric Company, Schenectady, N. Y.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METAL DIVISION

HEADQUARTERS, 29 W. 39 STREET, NEW YORK

The regular fall meeting of the Division will be held in Detroit in connection with the American Society for Steel Treating, Sept. 19 to 23. The technical meetings of the Division will occur on Sept. 20, 21 and 22. Papers to be presented will be of a practical nature and will deal with the heat treatment of copper, aluminum, nickel, zinc, and their alloys. During the entire week there will be an exhibition under the auspices of the American Society for Steel Treating which will also include non-ferrous exhibits of interest to our members. This is the first time that the Division has met with the American Society for Steel Treating, and it is hoped that the meeting will be a pronounced success. Arrangements have been made with the railroads for the round trip certificates for this meeting, and members of the Division will receive from the secretary's office copy of this certificate. If anyone interested in attending the meeting should fail to receive such a certificate, address the secretary of the Division, W. M. Corse, 810 Eighteenth Street, Washington, D. C.

The week of Sept. 19 will be convention week at Detroit since, in addition to the A. S. S. T. and the Institute of Metals Division, the American Welding Society and the Society of Automotive Engineers will be in session. Technical sessions of the Institute of Metals will be held at the Book-Cadillac Hotel. It will be wise to reserve accommodations well in advance.

ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

America is leading the world in the production of electrolytic zinc, electrolytic lead, and electrolytic copper. The American Electrochemical Society has arranged a trip through the Northwest, affording members an opportunity to see the very latest developments in the production of the pure metals starting from the minerals. The great mines, smelters and refineries of Trail, B. C., Anaconda, Wallace, Kellogg, Butte, and Great Falls will be visited.

A special A. E. S. train will start from Chicago on September 4th, returning on the 21st. The first stop is scheduled for Minneapolis, where the first scientific session will be held. Two other scientific sessions are included in the program; one at Vancouver and the other at Keokuk. Important papers on such timely subjects as the Electrodeposition of Rubber and Thin Film Rectifiers are among those to be presented for discussion.

The complete itinerary also arranges stops to visit industrial plants and power developments at Spokane, Seattle, Vancouver, and Keokuk. The new 7-mile tunnel being bored through the Cascade Mountains will be inspected, as well as the oil fields at Shelby. One day will be spent at Glacier National Park.

Local Committees of the various towns are arranging elaborate entertainment programs for the large number of members and guests who have registered for reservations. The total cost, including berth and meals, Chicago, is estimated at $182. Further details are obtainable at the offices of the American Electrochemical Society, Columbia University, New York City.

AMERICAN WELDING SOCIETY

HEADQUARTERS, 29 W. 39 STREET, NEW YORK

Among the papers to be read at the tentative program of the 1927 Fall Meeting American Welding Society to be held in Detroit, September 19, 20, 21, 22 and 23, 1927, at the Book-Cadillac Hotel are the following:

Airplane Welding by J. B. Johnson, Chief Material Branch, War Department, Air Corps, McCook Field.

Welding on the Long Distance Aircraft by Atlantic Aircraft Corporation.

Report of San Francisco Section's Investigations on "Study of Welds Subjected to High Temperatures."

Heat Treatment by the Oxy-Acetylene Flame by E. E. Thum, Associate Editor, Iron Age.

A Metallurgical Study of Welds by G. R. Brophy, Research Laboratory, General Electric Company.

EXPOSITION

The Welding and Cutting Exposition to be held under the auspices of the American Welding Society and in co-operation with the National Steel and Machine Tool Exposition in Detroit the week of September 19th will be the largest exhibit of its kind ever held. A special section of Convention Hall of over 10,000 square feet has been set aside for the welding exhibit. Consequently all of the exhibits will be grouped together and the thousands in attendance will have the opportunity to observe the latest and best equipment and developments in this line. The two previous exhibitions of the A. W. S. at Boston and at Buffalo occupied less than one half the space that will be devoted to welding at the Detroit show.

IRON AND BRONZE MANUFACTURERS

HEADQUARTERS, 195 PLATT STREET, ROCHESTER, N. Y.

The National Association of Ornamental Iron and Bronze Manufacturers will hold its 20th Annual Convention on September 20th, 21st and 22nd at West Baden, Indiana. This year the Convention bids fair to be the finest meeting that the Association has ever held.

The program of the Business Sessions shows several important matters to be discussed and decided upon by the members. Several matters of extreme importance to expansion in this industry and the outlining of a National Publicity and Advertising

Campaign will be acted upon. An extensive program is to be inaugurated to educate the general public in the new uses of ornamental iron, bronze and wire.

In addition, the subjects of standardization and individuality in the industry will be threshed out. It is also hoped to establish a closer co-operation with architects and contractors by the more general use of a standard classification list of materials for use in all specifications made up by architects and builders. This list has recently been adopted by the National Association of Ornamental Iron and Bronze Manufacturers and by the American Institute of Steel Construction. Its purpose is to prevent the usual misunderstandings now prevalent between buyer and seller.

The three hundred members of the Association will be accommodated in the West Baden Springs Hotel, West Baden, Indiana, and the entire hotel will be completely at their disposal. Its equipment and facilities are particularly adapted to the needs of a large business gathering of this kind.

LIGHTING FIXTURE ASSOCIATION

HEADQUARTERS, 420 LEXINGTON AVENUE, NEW YORK

A summarized report of the mid-summer convention of the Artistic Lighting Equipment Association in Atlantic City, N. J., in July, is as follows:

1. A. L. E. A. adopts sales promotional merchandising and refixturing campaign and authorize initial expenditure of $15,000 to begin work.
2. National Lighting Equipment Exhibition to be held in Chicago, June, 1928.
3. T. Yeoman Williams, Secretary of League for Industrial Rights, covered situation with reference to Union Labor.
4. Official Uniform Cost Formula of the A. L. E. A. presented and explained. Bound copies now ready for distribution and circulation, and should be adopted by all fixture manufacturers.
5. Following special groups in A. L. E. A. now well organized: Stamping and Parts Manufacturers' Group. Exterior Lighting and Lantern Group. Illuminating Glassware Group. Dealers' Group. Following special groups now in process of formation: Floor and Table Lamp Manufacturers' Group. Distributors' Section. Lacquer Manufacturers' Group.
6. Big intensive Membership Drive Campaign to be inaugurated to triple membership in three months; movement to be headed by: Herman Plaut, L. Plaut & Company, M. D. Blitzer, Lightolier Company.
7. Exterior Lighting and Lantern Group sponsor the production of a Co-operative Booklet on Outdoor Lighting and Lanterns and voluntarily underwrites its production outside of Association activities to the amount of $2,000.
8. New resolution adopted urging the continued sales and production of the G-25 and G-18½ Outside Ball Frosted Lamp.
9. Collection Department of A. L. E. A. reports collecting over $37,000.00 for members. Arbitration Department reports satisfactory settlement of eight cases of infringement of patent and copying of design.
10. Adopted reclassification of membership and change in By-Laws which will permit many memberships at a lower rate of dues.

EXPOSITION OF CHEMICAL INDUSTRIES

HEADQUARTERS, GRAND CENTRAL PALACE, NEW YORK

When the doors of the Eleventh Exposition of Chemical Industries open at the Grand Central Palace, September 26th, for the first time in the history of the Exposition, foreign methods and practices will be shown giving the manufacturers and users of the products the opportunity to compare domestic and foreign products, methods and practices which today have reached a high state of efficiency in all industry.

Much interest has been shown in the Exposition by various manufacturers of various alloys. Among them are the Central Alloy Steel Company, Vanadium Company of America and the International Nickel Company. The Exposition management announces that it is receiving communications from many other manufacturers of metals and alloys and expects to be able to show between twelve and twenty of the various new non-corrosive iron and steel alloys.

In Arthur D. Little's publication for Chemists, Engineers, Managers of June, 1927, he quotes President Thomas F. Baker, Carnegie Institute of Technology, as follows:—"Farsighted men of Affairs must perceive that something more than financial resources is necessary for commercial progress. Modern business demands two kinds of capital: Money, and technical and scientific knowledge."

Chemists and engineers have during the last twenty-five years brought industry to its high standard through their untiring efforts and one and all are anxiously awaiting the opening of the Eleventh Exposition of Chemical Industries at Grand Central Palace, New York, September 26th to October 1st. The office of the management is in the Grand Central Palace Building and inquiries may be directed there.

OHIO-CLEVELAND EXPOSITION

HEADQUARTERS, CHAMBER OF COMMERCE BLDG., CLEVELAND, OHIO

The metal trade will have a place in the epoch-making Ohio-Cleveland Industrial Exposition in Cleveland, Ohio, Aug. 6 to 28, commensurate with its dominating position in the industry of Cleveland and of Northern Ohio.

Practically every branch of the iron and steel and the non-ferrous industry will be represented among the exposition exhibitors. For 23 days this exposition will present a graphic picture of the industrial and civic greatness of Northern Ohio of which Cleveland is the metropolis and chief trading center. Industry will dominate the exposition by sheer weight of numbers and from the fact its 12,000 mills and factories pay 1,000,000 wage earners one and one-half billions of dollars each year for aiding in production of its six billion dollars of manufactured products.

Great variety of the products of exhibitors insures a diversity of displays in the metal trades section. Finished products, machinery and equipment will be among the mill and factory and foundry output shown. Among the companies, which already have engaged space, are the following:

Allyne-Ryan Foundry Company.
Champion Machine & Forging Company.
Cleveland Graphite Bronze Company.
Cleveland Hardware Company.
Cleveland Welding Company.
Cleveland Worm & Gear Company.
Eberhard Manufacturing Company.
National Bronze & Aluminum Foundry Company.
Rickersberg Brass Company.
W. S. Tyler Company.
Walworth Run Foundry Company.
Wellman Bronze Company.
Wellman-Seaver-Morgan Company.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 VICTORIA STREET, LONDON, ENGLAND

PAPERS TO BE READ BEFORE THE INSTITUTE OF METALS IN SEPTEMBER, 1927

W. T. Cook and W. R. D. Jones. "The Copper-Magnesium Alloys. Part II."

W. Hume-Rothery. "Researches on Intermetallic Compounds VI.—The Reaction between Solid Magnesium and Liquid Tin."

K. L. Meissner. "Age-Hardening Tests with Elektron Alloys."

A. R. Raper. "The Equilibrium Diagram of Copper-Tin Alloys Containing from 10 to 25 per cent. of Tin."

Cyril S. Smith. "Note on Cathodic Disintegration as a Method of Etching Specimens for Metallography."

H. Sutton and A. J. Sidery. "The Protection of Aluminum and Its Alloys against Corrosion."

H. Sutton and J. W. W. Willstrop. "The Nature of the Film Produced by Anodic Oxidation of Aluminium."

C. J. Smithells, W. R. Pitkin and J. W. Avery. "Grain Growth in Compressed Metal Powder."

Marie L. V. Gayler. "The Undercooling of Some Aluminum Alloys."

A. G. C. Gwyer and H. W. L. Phillips. "The Constitution of Alloys of Aluminium with Silicon and Iron."

F. Hargreaves. "Effect of Work and Annealing on the Lead-Tin Eutectic."

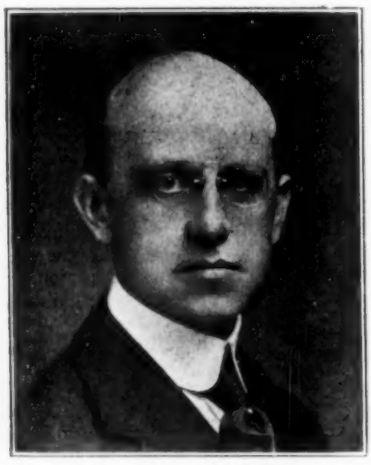
W. Hume-Rothery and S. W. Rowell. "The System Magnesium-Cadmium."

C. H. M. Jenkins. "The Constitution and Physical Properties of Some of the Alloys of Copper, Zinc and Cadmium."

Personals

WILLIAM A. COWAN

William A. Cowan, assistant chief chemist of the National Lead Company will sail on the Berengaria on August 31st, and will attend the meeting of the British Institute of Metals in Derby, England, Sept. 6-9, and also the Congress of the International Society for Testing Materials held in Amsterdam, Sept. 12-17.



W. A. COWAN

Mr. Cowan was graduated with the degree of B. A., Amherst College, in 1897. He is a member of the Beta Theta Pi Fraternity. He was laboratory assistant and instructor in Department of Chemistry, Brooklyn Polytechnic Institute, 1897-1899 and plant chemist, National Lead Company, 1899-1908. From 1908 to date he has been in the National Lead Company, Research Laboratories. He has written several articles, discussions and reports to technical societies on metallography and methods of analysis of white metal alloys.

Mr. Cowan is a Fellow of the American Association for Advancement of Science; Member, American Society for Testing Materials; Chairman, Sub-Committee on Methods of Analysis of Non-Ferrous Metals; Member, Mining & Metallurgical Society of America; American Institute of Mining & Metallurgical Engineers; American Chemical Society; American Electrochemical Society, British Institute of Metals; Society of Automotive Engineers; Franklin Institute; Advisory Committee on Non-Ferrous Metals, Bureau of Standards; Chemists' Club, New York.

George Paterson is now connected with the Irvington Smelting and Refining Works, Irvington, N. J. He was formerly with Balbach Smelting and Refining Company, Newark, N. J.

C. D. Parkhill, formerly in charge of the Enameling Plant at Gibson Refrigerator Company, Greenville, Mich., is now with The Ferro Enamel Supply Company, of Cleveland, Ohio.

The Bridgeport Brass Company announces the appointment of **William S. Kriebel, Jr.,** of Philadelphia, as salesman of Bridgeport Brass products in the Philadelphia territory. He will make his headquarters at the Bridgeport Brass Company's Philadelphia Office, located at Bankers Trust Building.

Wallace W. Boone formerly Professor of Chemistry at the University of Cincinnati and recently chief chemist for the Michigan Plant of the American Radiator Company, has accepted the position of chief chemist and assistant superintendent with the Rheinstrom Brothers Company, Cincinnati, Ohio.

John A. Toleik has severed a 17-year connection with the American Can Company to accept the position of chief engineer of the Gibb Welding Machines Company, Bay City, Michigan. Mr. Toleik has been in charge of all welding developments with the American Can Company and was personally responsible for the high production turned out in their many welding operations. Mr. Toleik's chief interest with the Gibb Welding Machines Company will be in the further development of their Research Department.

Obituaries

FREDERICK J. KINGSBURY

Frederick J. Kingsbury, chairman of the Board of Directors and Treasurer of Bridgeport Brass Company, Bridgeport, Conn., died at his home in New Haven, July 11, 1927. He was born in Waterbury, Conn., and received his early education at the English and Classical School in Waterbury. He attended St. Paul's School, Concord, N. H., and the Massachusetts Institute of Technology at Boston, being a member of the class of 1885. He worked during two summer vacations, the first year on a surveying squad on railroad construction; the second summer on the installation of a city telephone system.

Mr. Kingsbury's first experience in a manufacturing plant was with the Scovill Manufacturing Company in Waterbury, working both in the mills and office.

In 1889 he took up his duties as secretary of the Aluminum Brass and Bronze Company, now the Housatonic Avenue Branch of the Bridgeport Brass Company. In the panic of 1893 this business was liquidated and ceased to operate.

In January, 1895, he became secretary and director of the Bridgeport Brass Company and succeeded to the positions of treasurer, general manager and president. He resigned the presidency in September, 1921, becoming Chairman of the Board of Directors and Treasurer. He is a director of the First National Bank of Bridgeport.

For ten years he was president of the Morris Plan Bank, now vice president and a director; director, American Tube & Stamping Company; director and National Councilor of Bridgeport Chamber of Commerce; director, Bridgeport Housing Corporation; on Advisory Committee, Bridgeport Manufacturers Association; vice-president and director, University Club; Director, Union and New Haven Trust Company; director, Scovill Manufacturing Company; director, Manufacturers' Association of Connecticut; director, League for Industrial Rights; on Council Conn. Civil Service Association; on Council National Civil Service Association; Industrial Board International Y. M. C. A.; director New Haven County Anti-Tuberculosis Society; Chairman Board Trustees New Haven Y. M. C. A.

During the war he was on Finance Committee National War Work Council; Chairman United War Work Campaign in New Haven. He was a member of several clubs and civic societies.

JOHN N. SHREVE

John N. Shreve, former head of the Electric Cable Company of Waterbury, Conn., and his wife were killed in a motor accident on the Millford turnpike, July 16. He organized the company and was its president for 16 years. About three years ago it went into the hands of a receiver and he then went in partnership with James Coyle and took over the Essex Wire Company of Newark, N. J., of which he became president. He frequently visited this city since moving to Newark and had many friends here. Upon becoming president of the Newark company he changed its name to the Shreve Wire Company.

EDWARD A. WELLS

Edward A. Wells, general manager and one of the principal stockholders of A. H. Wells & Company, Inc., died from angina pectoris at his home in Waterbury, Conn., July 7. He was 47 years of age. He was the son of Ambrose H. Wells, founder of the company and with his four brothers, Samuel J., Franklin A., George H. and Clifford H. owned and operated the concern. It manufactures small tubes and other small

brass articles. He was a leader of the local Republican party and was considered the leading candidate for the nomination as mayor this year. He had been an alderman and member of the board of works for several years. He was a 32nd degree Mason, Knight Templar, and a member of the Elks, Knights of Phythias and the Pequot club. Besides his wife, Mrs. Carrie Wells and his four brothers, he is survived by his mother, Mrs. Evelina Wells, three sons, Edwin A., William F. and Kenneth R., and one daughter, Marion A.

CAESAR AUGUSTIN GRASSELLI

Caesar Augustin Grasselli, 77, chairman of the board of the Grasselli Chemical Company of Cleveland, Ohio, died July 28, at a hospital in Cleveland, following an operation and an illness of less than two months.

Mr. Grasselli was one of the leading manufacturing chemists of the country. For more than thirty years he was President of the Grasselli company, handing that office over to his son, Thomas S. Grasselli, in 1910. Since that time he had been Chairman of the board.

As the head of the house of Grasselli the aged manufacturer pursued a business from boyhood that had occupied his ancestors back as far as 1440 in Italy. The earliest record of the Grasselli family show that during the fifteenth century they were chemist-druggists, perfumers and gunpowder makers.

Six grandsons will act as pallbearers. Members of the Board of Directors of the Grasselli Chemical Company will be honorary pallbearers.

FRED L. CHAMPTON

Fred L. Champton, aged 66, president and treasurer of the Champton Farley Brass Company of Kansas City, Mo., died at his home, July 25th.

NEWS OF THE INDUSTRY

Industrial and Financial Events

AMERICAN BUYS McARTHUR LINE

The American Foundry Equipment Company, Mishawaka, Indiana, has purchased the McArthur line of rod straightening and shear machines. Henceforth they will be known as the American-McArthur Line. This company will carry on the business as heretofore. Machinery and equipment have been removed from Chicago to Mishawaka from where sales and service will be promptly handled.

WIRE MAKERS MERGE

Stockholders of the Illinois Wire & Cable Company met at Sycamore, Ill., August 8 to vote on a proposed plan of reorganization, and consolidation with the Chicago Insulated Wire & Manufacturing Company. This consolidated two of the leading manufacturers of insulated copper wire in the Middle West.

The company will be known as the Inland Wire & Cable Company, and will have a capitalization of 200,000 shares of $10 par value, of which not exceeding 105,000 shares will be issued. All the assets of the Chicago Insulated Wire & Manufacturing Company will be acquired for $600,000 and 16,000 shares of the new company's stock, which will be exchanged share for share for stock of the Chicago Company.

AIR REDUCTION BUYS OXYGEN PLANTS

Air Reduction Company, Inc., 342 Madison Avenue, New York, has purchased the business, insofar as the manufacture and sale of oxygen, acetylene, and kindred products are concerned, of the United Gas Improvement Contracting Company, a subsidiary of the United Gas Improvement Company, and the United Oxygen Company, Philadelphia. The purchase includes oxygen plants at Philadelphia, Chester, Milton, Enola, and Reading, Pa., and an acetylene plant at Bridgeport, Pa. Thus, the Air Reduction Sales Company, the sales organization of Air Reduction Company, Inc., has acquired through this purchase the production and distribution facilities of five additional oxygen plants and one acetylene plant in the industrial district of Eastern Pennsylvania. The company now operates thirty-four oxygen plants and nineteen acetylene plants, all located in or near principal industrial centers of the United States.

CONDENSER AND POWER MERGER

The Wheeler Condenser & Engineering Company, 149 Broadway, New York, and the Power Specialty Company, 111 Broadway, New York, have been consolidated. The new company will be known as the Foster-Wheeler Corporation. The Wheeler company has plants at Carteret, N. J., and Newburgh, N. Y., and has been one of the largest manufacturers in the United States of condensers and other steam auxiliary equipment, while the Power Specialty Company makes various types of steam generating equipment and oil refining equipment.

Combined assets of the two companies are said to be about $12,000,000. J. J. Brown, for eighteen years president of the Wheeler company, will become chairman of the board of the new corporation, while L. B. Nutting, who has been president of the Power Specialty Company, will be president. John Primrose of the Power Specialty Company will be vice-president in charge of the oil division and H. S. Brown of the Wheeler company will be vice-president in charge of the condenser division. W. E. Dowd will be secretary, having served the Power Specialty Company in that capacity.

BASSICK BUYS CASTER LINE

Foster Merriam Company, Meriden, Conn., manufacturer of furniture casters, cabinet hardware and gray iron, brass, bronze and aluminum castings, has disposed of the manufacture and sale of its line of casters to the Bassick Company, Bridgeport, Conn. This is done to give room for expansion of its foundry facilities and other departments. It will continue its lines of cabinet hardware, furniture trimmings and specialties.

SAVAGE ARMS GAINS

Savage Arms Corporation reports for the quarter ended June 30, 1927, consolidated net profit of $174,161, after depreciation and reserve for taxes, equivalent after preferred dividend requirements, to $1.95 a share earned on 87,474 shares of common stock. This compares with a deficit of $99,199 in preceding quarter and net profit of $291,580, or $3.29 a share in the second quarter of 1926. Consolidated net profit for the first six months of 1927 amounted to $74,962 after above charges, equal to 78 cents a share on common stock, against $361,106, or $4.05 a share in the first half of the previous year.

MARLIN-ROCKWELL PROFITS

The Marlin-Rockwell Corporation, Jamestown, N. Y., reports for the June quarter a net profit of $252,797, after expenses and taxes, equivalent to 73 cents a share earned on 343,761 shares of no par stock. This compares with $372,252, or $1.08 a shar, earned in the first quarter, and $298,433, or 84 cents a share, earned on 331,685 common shares outstanding in the second quarter of 1926, after preferred dividend requirements.

The net profit for the first half of 1927 was $625,049 after above charges, equal to $1.81 a share earned on 343,761 shares, against $692,479, or $1.95 a share, earned on 331,685 shares in the first half of 1926, after preferred dividends.

NICKEL COMPANY PROFITS

The report of the International Nickel Company for the second quarter of 1927 shows a net profit of $1,394,923 after Federal Taxes, depreciation and depletion, equivalent after preferred dividends to 75 cents a share earned on 1,673,384 shares of $25 par common stock. This compares with $1,407,707, or 76 cents a share, in the first quarter, and with $1,408,116, or 76 cents a share, in the second quarter of 1926.

The net profit for the first six months of 1927 was $2,802,630 after above charges, equal to $1.51 a share earned on the common stock, against $2,774,689, or $1.49 a share, earned in the first half of 1926.

FEDERATED METALS GAINS

The report of the Federated Metals Corporation for the six months ended May 31, 1927, shows a profit of $108,306 and a surplus after depreciation of $10,372. Net operations for the same period a year ago resulted in a loss, after depreciation, of $729,729.

Vice President Ivan Reitler said that the excess of current assets, exclusive of inventories, over total current liabilities was more than $1,000,000 greater on May 31, 1927 than at the end of the first half of the previous fiscal year. Through the operation of the sinking fund the total amount of the company's convertible 7 per cent bonds outstanding has been reduced to about $3,600,000. Bank loans on May 31 were reduced to $2,300,000 and have since been further reduced.

GENERAL ELECTRIC GAINS

General Electric Company sales billed for the first six months of 1927 as announced by President Gerard Swope, amounted to $149,795,026.99, compared with $147,450,867.96 for the corresponding period last year. Profit available for dividends on common stock for the six months of 1927 was $22,542,972.76, compared with $19,000,392.63 for the same six months last year. The profit available for common stock is equivalent to $3.13 per share in 1927 and $2.63 per share in 1926.

YALE & TOWNE EARNINGS

The net profit of the Yale & Towne Manufacturing Company for the June quarter was $527,413, after depreciation, Federal taxes and other charges, compared with $601,989 in the second quarter of 1926. For the first half of 1927 net profit totaled $1,060,288, after above charges against $1,193,321 in the first half of 1926. The surplus at June 30 was $9,621,148, against $9,524,046 at Jan. 1.

AJAX INSURES EMPLOYEES

The Ajax Metal Company of Philadelphia, Pa., has adopted a group insurance program providing its hourly paid workers with health and non-occupational accident benefits through contract with the Metropolitan Life Insurance Company.

All participating employees paid on an hourly basis will receive $10 a week when unable to work due to sickness from any cause or injury received while off the job. Beginning on the eighth day, payments will continue in each case of disability for a maximum of thirteen consecutive weeks.

A feature of the group plan is a visiting nurse service placed at the disposal of sick or disabled employees protected by the insurance company. In addition to this, pamphlets on disease prevention and health conservation are regularly distributed.

RUBBER REPLACING METAL

According to an item in the daily press, rubber is being increasingly employed to replace steel and even bronze. Rubber linings are used for grinding equipment because, as it is claimed, they withstand erosion. In many cases also it is the only substance which will withstand the corrosion of the chemicals employed.

WHO OWNS THE INGOTS?

Authorities are looking for the owner of $10,000 in copper ingots which nobody seems to want.

The ingots are stored in the Plainfield, N. J., storage warehouse on East Third Street. The Tax Board is trying to find the owner in order to collect the assessment.

Eli Bussel of the Plainfield Iron and Metals Company was assessed for the ingots but asserted they were owned by James J. Nash of 826 West Front Street. Nash disclaimed ownership, declaring the ingots were in the name of Bussel.

FRAUDULENT SALESMEN

In order to counteract the efforts of certain foreign houses to defraud American business firms, the National Association of Purchasing Agents has launched a campaign to acquaint the American public with these nefarious activities. It is estimated that "gyp" sales are now being made at the rate of six million dollars per year.

The National Association of Purchasing Agents reports one case in which a corporation president became so impressed with the quality of the material offered to him for trial that he personally signed an order blank provided by the salesman for a trial order of files and tool steel. Later, when the shipment arrived, it became evident that he had unconsciously signed an order so worded that his company was legally bound to a purchase amounting to six thousand dollars. Instead of being enough for a trial order, as represented by the salesman, the amount of material delivered would require many years to consume.

These salesmen keep technically within the law and rely upon the customers giving scant scrutiny to what they are asked to sign, particularly when they believe only a small amount of money is involved. Having secured the signatures to cleverly worded, trick orders or contracts, they frequently make delivery through forwarding agents, custom house brokers and bankers who are not in any way parties to the contracts. In the cases of foreign salesmen there are thus no chances of reaching them and, rather than stand the trouble of a law suit, some of their victims have paid the drafts. Some small factories have found these amounts sufficiently large to seriously cripple them financially in some cases.

All victims are invited to communicate with the National Association of Purchasing Agents, W. L. Chandler, Secretary, 11 Park Place, New York, N. Y.

UDYLITE COMPANY SOLD

Announcement was made August 7th that Fred J. Fisher of Detroit, Mich., and the Union Carbide and Carbon Corporation of New York have purchased outright the Udylite Process Company, located at Kokomo, Indiana. The purchase included all patents and patent applications owned by the Udylite Company. After August 15th sales and general offices will be at 3220 Bellevue Avenue, headquarters of the General Chromium Corporation. M. E. Louth of Detroit will be general manager of both of these enterprises.

Udylite, as is generally known in the trade, is the patented electrolytic application of cadmium as a rust proofing agent, the invention of Marvin J. Udy, well-known chemical engineer. The Udylite Process Company was incorporated under the laws of Indiana in 1922, and has been in successful and extensive operation since that time. The process has a silvery appearance, is highly rust resistant, and received a cordial welcome in the manufacturing world. Its influence upon the automotive industry has been pronounced, though it has spread to almost every department of industry.

Men conversant with the process and its varied uses believe that the field, large as it now is, has only been opened. The demand for a rust proofing agent that adds beauty to effectiveness, and at all times keeps within the costs imperative in modern business is increasing daily, and new uses for Udylite are constantly making themselves evident.

The board of directors of the new company is composed of Fred J. Fisher, Detroit, Mich.; F. M. Becket and Benjamin O'Shea of New York; A. E. Baldwin, I. Levin and M. E. Louth, Detroit, Mich.

The company has established European branches.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

AUGUST 1, 1927.

Officials of the **American Brass Company** here made no comment upon the acquisition last month by the **Anaconda Copper Mining Company** of the **Detroit Copper & Brass Rolling Mills** except to say informally that the deal will not affect local plants of the company. The general feeling about the city is gratification over the announcement that the new plant will be operated by the American Brass Company rather than directly by the Anaconda Company and in consequence will have a closer connection with this city than if operated by the parent company. The basis of the sale, not previously reported, is said to be that the Detroit Company stockholders have an option of receiving $21 in cash for each share of their stock or exchanging it for Anaconda Sales Preferred 6 per cent on the basis of one share of Detroit stock for 21-100th of a share of Anaconda Sales preferred.

Machinery and fixtures of the old **Blake & Johnson Company** plant on North Elm street are being removed. This building formerly housed the machinery division of the company. The business of the machinery division was sold some months ago to the **Torrington Manufacturing Company** of Torrington. The company, however, retained the physical property of the machinery division. It also has a plant on Thomaston avenue which it continues to operate as its manufacturing division, manufacturing a great variety of small brass articles. The machinery and equipment removed from the old Elm street plant is either being sold or installed in the Thomaston avenue plant. It is believed that the building and land on North Elm street will be sold shortly.

The **Mattatuck Manufacturing Company** is protesting against the plan of the city government to lay out Homestead avenue unless it be relieved from paying most of the assessments levied against it and given a guarantee that its dam and water rights will not be injured. The company has a dam across the Mad river and the proposed route of the street will run across this dam. The company claims it will receive no benefits from the new street yet will have to pay a large share of the assessments.

Percy De Forrest Warner, an employe of the **Scovill Manufacturing Company,** has retired after 33 years of service with that concern. For many years he was head of the button and fastener department and in recent years has been in charge of production and sales of this department.

The **Scovill Manufacturing Company,** continuing its policy of announcing monthly, the names of employes who have completed a quarter century of service with it, last month named **Maurice Carey, James Dillon, Patrick Tracy, Michael Wallace, Charles Parsons and John Birch.** Mr. Carey is in charge of the company's print shop. Mr. Dillon is a tester for Hoffman valves. Mr. Tracy is in charge of the fine wire department. Mr. Wallace is a foreman in the South rolling mill. Mr. Parsons and Mr. Birch are toolmakers.

F. S. Chase, president of the **Chase Companies, Inc.,** was toastmaster at the outing of the Chase Foremen's association and Chase Girl's club at Pleasure Beach last month. About 100 officials and employes of the **U. T. Hungerford Brass & Copper Company** of New York, recently acquired by the company, attended. The athletic events were designed to stimulate rivalry between the subsidiary divisions of the company, the Chase Rolling Mills, Chase Metal Works, Waterbury Manufacturing Company, the Noera Manufacturing Company and the main office.

F. S. Chase, who is a member of the Joint New England committee, which recently recommended the St. Lawrence as against the All-American route for a seaway from the Great Lakes to the Atlantic, last month defended the report of the committee against the claim of Senator Copeland of New York that the report was "hare brained scheme" and would ruin the ports of New England, New York, Pennsylvania and Maryland. A consideration of the personnel of the committee will show that it is presumably intelligent and a careful examination of the report will show that Senator Copeland either has made only a cursory examination of it or else is blinded by local prejudice, he said. The St. Lawrence route positively will not hurt the ports mentioned, he declared. Its chief recommendation is the small expense as compared to the other route, the fact that it is a more natural outlet, and that it will make for greater unity of the United States. The decision to build the proposed All-American route would be in the nature of an insult to Canada in that it would indicate a lack of confidence on the part of this country in the good faith of Canada. The St. Lawrence route will mean the utilization of a tremendous amout of hydro-electric power while the other route will utilize none, he said.—W. R. B.

BRIDGEPORT, CONN.

AUGUST 1, 1927.

The directors of the **Stewart-Warner Corporation,** which owns the **Bassick Company** of this city, at their meeting last week, ordered that the remaining outstanding preferred stock of the Bassick Company, amounting to about $750,000, be called immediately at 110 and accrued dividends. Most of this stock is held by local investors.

The **Ives Manufacturing Company,** manufacturers of mechanical toys, has filed with the secretary of state a notice of an increase of capital stock. The 500 shares of common with a par value of $100 each are to be replaced by 6,000 shares of common stock without par value and 1,250 shares of preferred stock without par value. The latter bears interest at the rate of $6 a share to become cumulative only after payment in full of the principal and interest of the second mortgage 6 percent gold bonds.—W. R. B.

CONNECTICUT NOTES

AUGUST 1, 1927.

NEW BRITAIN.—Directors of the **Stanley Works** at a special meeting held last month, voted to call a meeting of the stockholders and recommend to them that the seven percent preferred stock of the company be retired and that in place of it six percent preferred stock be issued. The amount to be issued is $3,800,000. The original issue in 1920 was $5,800,000 but since that time, $2,000,000 of it has been retired. The directors also voted to submit to the stockholders the advisability of accepting the amendment to the charter of the company passed by the recent session of the legislature. This transfers to the Stanley Works certain franchises owned by the **American Tube & Stamping Company** of Bridgeport recently acquired by the Stanley Works.

BANTAM.—The **Bantam Ball Bearing Company** will move from this place to some city in the Middle West, W. S. Rogers, president of the concern, announces. It will probably locate in Toledo. The company owns a $200,000 concrete plant here which it will have to sell or abandon. The reason for the proposed move, according to President Rogers, is the high cost of power here, high taxes and the disinclination of the community leaders to allow the place to become a manufacturing town. Bantam is in the town of Litchfield which has been famed for years as the "parlor town" of the state and is essentially a residential town. The property owners, according to President Rogers, are opposed to having workingmen settle among them. The industrial commissioner of Toledo has been negotiating with Mr. Rogers relative to finding a suitable location for the company in Toledo.

WINSTED.—The **Strand & Sweet Manufacturing Company** of Winsted and the **Kent Brothers Electric Manufacturing Company,** Limited, of England, have purchased the entire stock, machinery, equipment and business of the **Super-Insulated Wire Company** of Plymouth, Mass. Half the machinery will be shipped to London and the balance here. Arthur Kent of the London concern, is a large importer of wire.—W. R. B.

PROVIDENCE, R. I.

AUGUST 1, 1927.

The metal trade industries of Rhode Island have been in a sort of doldrums for several weeks, due to a very large extent, to the building trade strike that has been going on for nearly three months. While there is an unusually large volume of building going on throughout the State the builders' troubles have tied things up. This cessation has been reflected in an enforced curtailment in various lines of metal work. In the jewelry lines the usual summer lethargy prevails but the prospects are believed to be promising for good business in the fall lasting over the holidays. Machine and small tool business during the past couple of months, and in fact, the most of the first half of the year produced sales of about 60 to 70 per cent of those received in the corresponding period of last year.

Metals and metal products, on the other hand, are with textiles, the outstanding industrial activities of Rhode Island, as shown by the recent publication of statistics of corporation tax returns made to the Federal Bureau of Internal Revenue in 1926 on earnings during the calendar year of 1925. These statistics present a mass of interesting information regarding the industrial, commercial and financial activities of the State. In the metal manufacturing industry 316 corporations reported, but only 173 of these had gross income, and that in the aggregate amounted to $96,345,118 from which they reported a net income of $9,957,248 and upon which taxes amounting to $1,064,467 was paid. The 143 metal corporations reporting no net income had a gross income of $24,452,756 and an aggregate deficit of $2,599,335.

The old-established firm of **H. F. Carpenter & Son,** went out of business early the past month. This marked the passing of one of the oldest concerns in this country engaged in the refining business for the manufacturing jewelry and silverware industries. It was founded in 1860 by Horace F. Carpenter, who had learned the business from L. Darling & Company of Providence, the first firm in the United States to devote itself exclusively to jewelry refining. This firm had been located at 58 Page street since 1870. In 1912 Horace F. Carpenter retired and the business has since been conducted by his son, Horace A. Carpenter, who has now retired, after being in the business himself for forty years.

The second annual sales conference for retail jewelers conducted by the **Gorham Manufacturing Company** was held at the company's plant at Elmwood July 11 to 15 inclusive and was attended by nearly 150 retail jewelers representing 35 different States and Canada. Courses of lectures were given daily by men prominent in their particular fields, which considered every phase in the operation of all the departments of a store. These included selling, advertising, window display, direct mail, departmentizing and merchandise budgeting, etc. A study of making of bronze and silver was made by the visitors who made inspections of the various departments of the plant in order to see first-hand how these goods are made. The object of the conference is to co-operate with the retail jewelers to aid them in the general increase of their business and thereby through stimulation of silverware sales increase the local business.

Paying his first visit to this country, **Henry Wilson,** the noted English sculptor, on June 30 attended the "pouring" of several bronze doors at the plant of the **Gorham Manufacturing Company** at Providence, which are to be hung at the main entrance of the new Salada Tea Company building in Boston. The doors were sculptured at the Wilson studios in Paris, the work having been started nearly three years ago and the work is said to be surpassed only by the famous doors of the Milan Cathedral, and up to the present time have cost more than $100,000. It won the bronze medal, the highest award given to a foreigner, at the Paris Salon last spring. With the exception of pieces done for Ralph Adams Cram and used in that architect's cathedrals, the Salada doors represent the first large pieces of Mr. Wilson's work brought to America. The work depicts the "History of Tea," and is done in high relief. Certain of the panels show heroic figures of natives in the act of loading the products. One is of three elephants with a mahout while another shows two small loading barges under the stern of an ocean freighter. There are also several free figures symbolic of the deities that are supposed to hold the prosperity of the industry in their hands.—W. H. M.

MIDDLE ATLANTIC STATES

NEWARK, N. J.

AUGUST 1, 1927.

Though it is agreed that the **Noxon Chemical Products Company,** of 70 Morris Avenue, is now solvent, it was insolvent August 6, 1925 at the time Federal Judge Runyon made permanent the appointment of Archie E. Ormond and Charles R. S. Leckie as receivers for the concern. The point was decided in the Federal Court by Edward J. Fox, Jr., of Easton, special master. Counsel for some of the minority stockholders contended that proof of the insolvency of the company would show that the receivership resulted from other interests to wreck the Noxon Company. The special master will continue the hearings later. Mr. Fox was appointed special master several weeks ago by Federal Judge Kirkpatrick of the Eastern District of Pennsylvania after an affidavit of bias and prejudice had been filed to take the case out of Judge Runyon's hands.

The following Newark concerns were chartered here: **Technical Radio Laboratory,** 100 shares no par; manufacture radio supplies; **Ever Ready Lighting Fixture Company,** $50,000, manufacture lighting fixtures; **Brabson, Inc.,** brass goods, $100,000; **American White Gold Company,** manufacture novelties, $100,000; **Vacuum Control Carburetor Company,** manufacture carburetors, $10,000; **Union Plumbing Supply Company,** plumbing supplies, $100,000.—C. A. L.

TRENTON, N. J.

AUGUST 1, 1927.

Conditions in the metal industry here show little signs of improvement and the manufacturers do not expect business to pick up to any extent until early fall. Slack building conditions are held responsible for the decrease in output.

A fight to register its trade mark for wire rope has been won by the **John A. Roebling's Sons Company** in a decision just handed down by the Patent Office. The mark is described as "of a green fibrous core of the wire rope." The **Waterbury Sons Company,** of New York, objected to the trade mark as interfering with their own mark for wire rope and Manila rope, which also used green colored strands. The Patent Office held that the use of colors was common in such trade marks, and that the marks of respective concerns are not similar enough to be confused by the trade.

Under a decree signed by Federal Judge Rellstab in the United States Court here, a $2,000,000 mortgage held upon the property of the **J. L. Mott Company** by the Guaranty Trust Company, of New York, is ordered foreclosed and the lien satisfied. Unless principal and interest are paid it is directed that the real and personal property covered by the mortgage be sold and the price applied to the liquidation of the obligation.

It is understood, however, that an effort will be made to reorganize the company, pay off the mortgage and keep the plant in operation. It is now in the hands of **Charles H. Baker** and **Robert K. Bowman** as receivers. The decree recites that there is now due under the lien the sum of $2,181,163, representing principal and interest. The receivers are ordered to satisfy the debt within a certain time or the property will be disposed of. Former Judge George W. Macpherson, as special master, was assigned to conduct the sale. The mortgage was made by the Mott Company to the Guaranty Trust, as trustee, on June 1, 1906. The mortgage secured bonds totaling $2,000,000, all of which were said to be issued and outstanding. On June 1, 1926, it was continued, the Mott Company defaulted in payment of the principal and $50,000 in interest. Since that time the total due has grown to a large sum.—C. A. L.

MIDDLE WESTERN STATES

TOLEDO, OHIO

AUGUST 1, 1927.

Announcement is made that the **Welder Company,** the **Electric Welding Machine Company** and the **Winfield Manufacturing Company** at Warren, Ohio, have been merged under the corporate name of the **Taylor-Winfield Corporation,** with combined assets of more than $350,000. Officers of the company are Albertus C. Taylor, president and general manager; G. P. Gillmer, vice president; J. H. Ewalt, treasurer, and N. H. Cobb, secretary. The directors are A. C. Taylor, L. Jennings, Fred W. Platt, N. H. Cobb, J. H. Ewalt, G. P. Gillmer, W. A. Wilson and W. A. Jones. Work is under way on the construction of a modern fireproof addition which will more than double the capacity, contract having been let to the **Warren Engineering Company.**

Toledo seems to be more favorably situated than many other of the large manufacturing centers. Most of the plants are operating, many nearly to capacity. This is particularly true as it relates to the metal field. The plating industry also is quite active. Most of the plants are busy.

Toledo has such a varied line of industries that it is not materially effected when one or even more experiences a slow-up. The outlook for the fall months is favorable in nearly every line that is produced here.—F. J. H.

DETROIT, MICH.

AUGUST 1, 1927.

The **Bohn Aluminum & Brass Corporation,** Detroit, has recently awarded the contract for the construction of its factory building to the Kreighoff Company. Christian H. Brandt, Detroit, is the architect.

The **American Brass Company,** Waterbury, Conn., now maintains an office in Detroit. It is in charge of Charles E. Warren, 900 Union Trust building.

The **Super Arc Welding & Body Company** has recently incorporated in Detroit with a capital stock of $25,000. It is located at 17 Beaubien street.

The **Anaconda Copper Mining Company** interests having acquired the **Detroit Copper & Brass Rolling Mills,** the latter company, it is announced, will be operated as a unit of the **American Brass Company** under the title the **American Brass Company, Detroit Branch.** Officials of the Detroit organization are **Lewis H. Jones** and **Arthur Quigley,** vice presidents; **Frank H. Hoffman,** manager; **Charles F. Craig** and **Andrew J. Peoples,** assistant managers; **Alexander Henderson,** works manager.

Authorized capitalization of the **Wolverine Brass Works** of Grand Rapids, Mich., it is announced, has been increased from $1,000,000 to $1,500,000. Of the new stock, $350,000 is six per cent preferred and has been subscribed and paid in. About $600,000 of common stock has been subscribed and also paid in. The company recently took action to continue its corporate existence for 30 years.

The **Health Aluminum Company** has recently been incorporated in Detroit. It will deal in aluminum and other metal castings, utensils and wares. The stockholders are Joseph M. Liebig and John H. Verkler, Peoria, Ill.; and R. E. MacDonald, 16410 Hamilton avenue, Detroit.

General business in the non-ferrous metal industry has a more favorable appearance during the present month. The outlook for fall is even better. The motor car companies and the accessory plants have considerably revived during the last few weeks. The fall models are now being shown and sales consequently are on the increase. The outlook in the motor car field is better than at first expected.

Conditions among the manufacturing jewelers, however, are not so encouraging. This industry has been quiet for a considerable time. The same is true regarding plumbing supplies. Manufacturers are feeling the decline in the building industry. Taking conditions as a whole, however, the outlook is more favorable than it was back in the early spring.—F. J. H.

CHICAGO, ILL.

AUGUST 1, 1927.

Arthur Haas has opened a brass foundry in Chicago. He was formerly located at Burlington, Wis. Many of the employees who were with him in Burlington have left to work for him in his new industry in Chicago.

The discovery of the famous **Calumet** copper mine in the Upper Peninsula was due almost entirely to chance, according to records recently uncovered in this part of the country. It appears that several centuries before white men set foot on American soil, a party of Indians dug up some copper on Isle Royale. They made a cache of the copper as they did not care to transport it all overland.

The indians never came back for it evidently, and such were the conditions in 1858 when a miner named Hulbert was surveying a state road from Copper Harbor to what is now the southwestern limit of Houghton county. Roaming about in the woods, he stumbled across the pit where the copper from Isle Royale lay buried. This he mistook for an old Indian mine. Looking about the vicinity for further traces of workings, he found a few hundred feet to the southwest, near what was afterward Hecla No. 1 shaft, a large block of conglomerate. This rock, weighing many tons, was infiltrated with copper and was in fact a bit of the Calumet conglomerate.—A. P. N.

MILWAUKEE, WIS.

AUGUST 1, 1927.

Conditions in the metal industry in the Wisconsin territory during the past month have been very favorable to the trade in general, according to many of the foundries here. Much building has been going on for the past few months and the demand for copper, brass and bronze products has been quite steady. There is expected to be no let up in building operations in this vicinity until late in the fall, and until that time the trade is expecting a very good volume of business.

A number of improvements were made last month to the building of the **Chicago Iron & Metal Company,** Ashland, Wis., according to an announcement by the owners.

The **Wisconsin Aluminum Foundry Company,** located at Manitowoc, Wis., has increased its capital stock to $100,000.

Albert Leyse, manager of the **Leyse Aluminum Company,** Kewaunee, Wis., states that work is well under way for the new addition to his firm's plant which will be 56 x 97.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

JULY 15, 1927.

The metal rollers of Birmingham and district have experienced a slackening in demand during the past few weeks and works are not able to make full time. The weakness of copper has brought a reduction of ¼ d per lb. this week in seamless drawn brass tubes, drawn copper and brazed copper tubes. Foreign business is falling away and merchant business lagging. The demand from bedstead makers for tubes is quiet, but the trade has derived some benefit from recent contracts given out by British railways. The advantages of copper tubes for water conveyance are being more and more recognized by domestic consumers partly because of their better resistance to corrosion and consequently longer life. Brass founders meet with a moderate demand from the home market but overseas business continues quiet.

The **Worshipful Company of Goldsmiths** is initiating a competitive scheme to stimulate artistic work and production in the precious metals. It is a scheme for small articles of

original design which will be saleable at prices from £1 to £50. Specimens selected by the judges will be purchased by the Silversmiths' Company to the value of £500, provided that in the opinion of the judges, sufficient good specimens are submitted of representative modern work. The chosen articles will be exhibited anonymously. It is pointed out to intending exhibitors that the Worshipful Company is not a trading concern, and that the sole object of the scheme is an endeavor to stimulate and co-ordinate the efforts now being made to produce work in the precious metals worthy of the past traditions of the craft, and to interest the public in such work. The judges for the competition will be Sir Edwin Lutyens, R. A., Charles Aitken, director of the Tate Gallery, J. B. Fletcher, Principal of the Birmingham Art School and others. In conjunction with the scheme an exhibition of modern craft silver ware is now open at the showrooms of the Goldsmiths and Silversmiths Company.

The net profit of the **Mond Nickel Company** for the financial year ended April 30 shows a reaction from the big recovery of the previous year. The coal stoppage seriously interfered with refining last year and the Clydach works of South Wales were closed for two months for lack of suitable fuel at economic prices. As a result profits are some £28,000 lower at £375,000 but the directors are able to maintain the 7½ per cent final dividend on the ordinary capital, making 12½ per cent for the year, the same as in the three preceding periods.

The chairman of the **Birmingham Mint, Ltd.**, presiding at the 39th ordinary general meeting, announced that trading for the year ended March 31 revealed a loss of £450, 4s, 11d. The year was in some ways the worst experienced since the formation of the Company and although the result was to be deplored he did not think it would come as a surprise to anyone who followed the course of industrial events in 1926. After those disturbances the return to normal conditions must be a slow and difficult process.—J. H.

Business Items Verified

Henrik Ipsen, 69 Liberty Street, Brooklyn, N. Y., is contemplating the installation of a small nickel plating plant, and would like information on equipment required, etc.

Brown Instrument Company, Philadelphia, has opened a repair and service station at 217 East Illinois Street, Chicago, to serve the midwestern territory.

Advance Plating and Finishing Company, 318 Holmes Street, Youngstown, Ohio, has started an electro-plating and finishing plant.

The **Harshaw, Fuller and Goodwin Company**, 100 Newburg Avenue, Cleveland, Ohio, awarded contract for the construction of a two-story, 38x40 ft. chemical plant.

The **Florence Stove Company**, of Gardner, Mass., is installing two Ferro type charging forks for porcelain enameling furnaces.

The **Perkins Brass Company**, Taunton, Mass., has begun work on a new foundry and machine shop. Polishing, lacquering and grinding departments will also be operated.

The **Northwestern Metalware Company**, Portland, Oregon, moved into a new two-story factory building, 60x180 ft. This firm operates the following departments: stamping and soldering.

The **McVoy Sheet and Tin Plate Company**, 1050 W. 36th Street, Chicago, Ill., has removed its offices and job galvanizing department to the above address, where its two galvanizing plants and warehouses are now concentrated.

American Art Bronze Foundry, 4921 West Lake Street, Chicago, has been incorporated with $25,000 capital to manufacture bronze art works. This is an old firm which was founded in 1885.

Two complete new porcelain enameling furnace units have been installed for the **Servel Manufacturing Company** at Evansville, Ind., by The Ferro Enamel Supply Company, Cleveland, Ohio.

The **General Electric Company**, recently installed a new Hurricane dryer in its Schenectady, New York, Porcelain Enameling Department. Equipment furnished by the Ferro Enamel Supply Company, Cleveland, Ohio.

Ingersoll-Rand Company has opened a Branch Office at 236 High Street, Newark, N. J. F. K. Armstrong, formerly connected with the company's New York Sales Branch, has been appointed manager.

The **Emerson-Brantingham Corporation**, of Rockford, Ill. is making improvements in their Enameling Department, including two large enamel dryers, and special charging forks. Equipment is being supplied by The Ferro Enamel Supply Company, Cleveland, Ohio.

The **V. C. Squier Company**, Battle Creek, Mich., manufacturer of musical instruments and supplies, has awarded a general contract for an addition to cost about $25,000. They use silver, silver-plated copper and aluminum wire, and spin on gut centers.

The **Lake Shore Brass Company**, Holland, Mich., recently organized, is arranging for a local plant for the manufacture of brass, bronze and aluminum castings. A. W. Wrieden is president and Ernest Sulkers, secretary and treasurer. This firm operates the following departments: brass, bronze and aluminium foundry, brass machine shop.

H. L. Carpenter, Jr., and **John A. Morrison**, after a service of over twenty-five years each with the Ajax Metal Company, Philadelphia, Pa., announce that they have amicably severed connections with that company and have formed the Car-Mor Metal Company, with headquarters at Gaul and Gordon streets, Philadelphia, Pa. They will buy, sell and manufacture non-ferrous metals.

In our July 1927 issue, page 315, that we mis-stated the incorporation of the **American Art Bronze Foundry**, Chicago, Ill., as the **American Bronze Foundry**. In our article it was stated that the incorporation is that of a new firm. It is really the incorporation of a very old firm and not under a new name, but for a new purpose, that of expansion. Mr. Jules Berchem, the former proprietor, has been in this line since 1885, and the firm was established in 1904.

The **Lincoln Electric Company** announces that the Missouri District office has been moved from 1808 Railway Exchange Building, St. Louis, to 1003 Davidson Building, Kansas City, Robert Notvest being in charge. The St. Louis District will be handled by Mr. Notvest, his time being divided betwen the two cities. A branch office has also been established at 220 Nicholas Building, Toledo, Ohio, A. H. Homrighaus, formerly in charge of the Missouri District having been transferred to Toledo in charge of the District.

The **E. R. Caldwell & Son Brass Company**, of Syracuse, N. Y., has adopted a group insurance program that provides for its employes weekly benefits in case of sickness or non-occupational accident. The plan is cooperative and includes a visiting nurse service, which is offered without additional charge to insured employes. Underwritten by the Metropolitan Life Insurance Company, the group program features the cooperative arrangement, under which joint contributions toward premium payments will be made by the employer and employes.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	90	92
American Hardware Corporation	$100	81	84
Anaconda Copper	50	45½	46
Bristol Brass	25	8	10
International Nickel, com.	25	64	64¼
International Nickel, pfd.	100	107	110
International Silver, com.	100	168	170
International Silver, pfd.	100	119	121
National Enameling & Stamping	100	29½	30½
National Enameling & Stamping, pfd.	100	91	95
National Lead Company, com.	100	109	110
National Lead Company, pfd.	100	132	132½
New Jersey Zinc	100	179	181
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company	..	56	58
Yale & Towne Mfg. Company	..	82½	83

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York

AUGUST 1, 1927

Buying activity in brass and copper rods, sheets, tubes and wire was stimulated by an advance in price of ½c. per pound during July. Nevertheless there was still some reluctance on the part of buyers to place contracts or commit themselves for any unusually heavy purchases. This attitude is no doubt a reflection of a lack of confidence in the copper market. In the past year or so there have been several movements upward which were short lived and the strength exhibited in the market proved to be merely a gesture which soon ran its course after which the market slumped back to the 12½c. level from which it is recovering for the second time this year.

So far as the consumers are able to observe there is nothing in the present business situation to justify any increase in price because of increased demand or consequent absorption of production capacity for fabricated products. Changes either up or down rest entirely on the quotations for ingot copper. The differential between ingot copper and the finished fabricated products has been cut so thin by competitive conditions that the quotations on these finished products must of necessity follow the fluctuations of the copper market very closely. Consumers being fully aware of this and also being somewhat confused by the fluctuations in copper prices have therefore apparently been content to cover for actual requirements only. This absence of speculative buying makes for a healthier condition and if the copper producers are able to maintain the higher level of prices for the raw material the entire industry should benefit as a result of the increased confidence that would be established.

There are some complaints heard from various mills because of unbalanced order books, some departments being fairly busy while others are in need of business. Nevertheless as a whole the position is fairly good taking into account certain seasonable items. The electric refrigerator manufacturers have again run into a slump which has held up a considerable tonnage of sheet copper, seamless tubes and Monel metal. On the other hand the general consuming trade has been reasonably busy and while purchases have been confined almost entirely to a hand-to-mouth basis the total requirements have kept the manufacturers in a mood marked by a fair degree of contentment while hoping expectantly and somewhat optimistically for a larger volume of trade.

The lack of activity in the refrigeration industry and the inability of this trade to consume Monel metal in the same huge volume as last year, has, of course, been somewhat disappointing to the producers of Monel metal. However, so many new applications for both Monel and nickel are constantly being developed that the demand has kept the tonnage figures for these materials on a very high level. Two important items in this line are the new Girard College buildings in Philadelphia and the enormous new hospital centre on Washington Heights in New York. In both of these large projects Monel metal and nickel are being installed in all departments, especially in the kitchens and laboratories, the total amounts running to extremely large figures.

Summing up the situation as it now appears it may be said that manufacturers in the non-ferrous metal industry are without anxiety as to the future, but rather look forward with a conservative feeling of optimism born of the belief that a steady improvement in general business may be expected from this time forward.

Metal Market Review

Written for The Metal Industry By R. J. HOUSTON, of D. J. Houston & Company, Metal Brokers, N. Y.

COPPER

AUGUST 1, 1927

Recent business in copper was good and trading for both domestic and foreign account broadened out in a manner that was highly gratifying to producers. Prices strengthened, and fresh buying by the consuming industries for nearby and future delivery provided a large outlet for supplies. Orders increased in volume and the market continued to gain in firmness until the wave of buying lifted quotations to 13 cents per pound. This price became firmly established, but there was a lull in buying during the closing days in July. The price for export was advanced to 13.25c c. i. f. European ports. Demand for foreign account was brisk during the past month, with Germany a prominent factor in the buying. The more favorable position of copper, as shown, by the statistics for June, commanded special attention. Output of refined copper during the month of June amounted to only 226,466,000 pounds, against 251,162,000 pounds in May, being a reduction of 24,696,000 pounds. Domestic deliveries in June dropped off to 126,930,000 pounds, a decrease of 12,628,000 pounds compared with the May figures. Exports, however, were the largest in over two years and amounted to 122,974,000 pounds, an increase of 29,016,000 pounds over the foreign shipments in May. Stocks of refined on July 1st amounted to 192,720,000 pounds, a decline of 23,438,000 pounds in 30 days. The market closed firmer at 13⅛c domestic delivery.

ZINC

Consuming demand was in good volume during recent weeks as the market developed an upward tendency. Curtailment of smelter output is in evidence at several plants, and this feature contributed to firmer conditions and increased confidence among buyers. It is a question, however, if production has been sufficiently reduced to permanently clear up the situation. Zinc production of the principal countries of the world in the first half of 1927 amounted to 733,700 tons, compared with 690,100 tons in the first half of 1926. The rate of increase in output was therefore about 6.3%. Production in the United States decreased slightly this year in comparison with the same period last year, but there was a large increase in output by foreign sources. American stocks in smelters hands on July 1 amounted to 43,858, being an increase of 1,812 tons effected in June. Renewed inquiry and market firmness were features at close of month.

TIN

There were sharp declines in both the London and New York tin markets early in July. Straits tin for prompt delivery developed weakness early in the month and declined from 65⅝c to 64½c in a short time. Speculative operators in London were actively manipulating the market in carrying out a squeeze, but the latter collapsed rather suddenly, and the price of spot tin fell rapidly as noted. American deliveries of tin in June amounted to 5,735 tons, and total world visible supply on July 1 was 15,638 tons, as against 14,655 tons on June 1, an increase of 983 tons. This increase was less than expected. Domestic deliveries for the first half of 1927 were 37,335 tons, compared with 40,115 tons for the first half of 1926, a decrease of 2,780 tons. There were further displays of weakness in the first half of the past month. There was active buying from time to time. Near the end of the month the price for nearly all positions was on a parity, with quotations for Straits at 64½c to 64⅝c. Domestic deliveries during July amounted to 5,950 tons.

LEAD

There was a series of price advances in lead recently, and since July 7th the market has advanced from 6.20c New York to 6.60c per pound. Demand was good from all sources of consumption. Producers sold heavily for July and August shipment, and buyers were eager to obtain even greater supplies than holders offered. There has been a general improvement in the situation, and bullish sentiment has replaced the depressed conditions prevailing a few weeks ago. Buyers have been seeking September shipments, but producers have turned down inquiries for so far ahead. This attitude on the part of producers indicates that a definite turn for the better has occurred. The firmer tone of the foreign market has helped to bring about improvement here. Consumers abroad were conservative for sometime, but they will have to replace depleted stocks to carry on accustomed activities.

ALUMINUM

The market for aluminum has maintained its steady tone and prices for Virgin ingot of 99% plus remains at 26c and Metallurgical 94 to 99% quotes 25c. Demand was variable lately, but reports show that consumption during the first half of 1927 was at high rate. There was some buying for third quarter requirements, and heavy shipments are expected over the balance of the year. Imports of aluminum during the first five months of 1927 amounted to 26,429,680 pounds against 33,831,969 pounds in the first five months of 1926.

ANTIMONY

Demand was quiet during a good part of the time recently. Despite dull conditions sellers were not disposed to offer important concessions as an inducement to buyers. Spot supplies sold for less than the quotations on futures, and some business was done during the last half of the month at 11¾c, duty paid, for prompt delivery. August and September deliveries were held at 12⅜c @ 12½c, and October delivery sold at 12½c with firmer tone and a little more inquiry from consumers near close of month. The Chinese market was strong, with advancing tendency on signs of improvement in domestic quarters. Shipping difficulties retard business, and under present conditions normal trade with China is greatly hindered. There are reports that Chinese authorities contemplate the placing of a stiff export duty on antimony. Action to that effect would probably give a sharp upward movement to the market. Stocks in bonded warehouses at end of June were reported at 3,480,455 pounds.

QUICKSILVER

A fair volume of business was reported, and recent price was quoted at $121 per flask. Foreign quotations were above the local market. Stocks were in good volume, but consumption was at a high rate.

PLATINUM

The price of refined platinum is quoted at $65 to $66 per ounce at which the market has remained steady for sometime past. With increase in the Russian production in recent years and the developments in the Transvaal output has exceeded requirements according to authorities on the subject. The price has consequently declined to present levels.

SILVER

Prices of silver lately moved in a fairly narrow range, due to the lack of any notable development. Market movements are determined by the trading attitude on the part of dealers and speculators in London, New York, Bombay and Shanghai. There was a recent active demand for China and India and price rose sharply from 56c to 56¾c, but the market reacted again to 56¼c. Deduction of Indian silver reserve from 950,000,000 rupees to 500,000,000 rupees over a period of seven years has been recommended by the Indian Currency Commission. The Chinese embargo has proved somewhat of a handicap on the usual dealings in silver.

OLD METALS

The scrap metal markets have been keeping pace to a considerable extent with the improvement in the Virgin metals, copper, lead and zinc. Stocks are moving more freely and dealers are able to realize decidedly better prices than was possible a few weeks ago. Export inquiry has expanded and England and Germany display interest in brass and copper grades. A firmer tone and better inquiry prevailed as the markets for new metals developed strength. New York buying prices were quoted at 10½c @ 10¾c for heavy copper, 9c @ 9¼c for light copper, 6½c @ 6¾c for heavy brass, 5½c @ 5¾c for light brass, 8¾c @ 9c for new brass clippings, 5⅜c @ 5½c for heavy lead, 3¾c @ 4c for old zinc, and 18½c @ 19c for aluminum clippings.

Daily Metal Prices for the Month of July, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4*	5	6	7	8	11	12	13	14	15	18
Copper (f. o. b. Ref) c/lb. Duty Free												
Lake (Delivered)	12.625	....	12.625	12.625	12.625	12.625	12.75	12.75	12.75	12.75	12.75	12.875
Electrolytic	12.375	....	12.375	12.375	12.50	12.50	12.50	12.50	12.375	12.50	12.50	12.625
Casting	12.375	....	12.375	12.375	12.375	12.375	12.50	12.50	12.375	12.375	12.375	12.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.15	....	6.15	6.15	6.20	6.20	6.20	6.20	6.175	6.175	6.20	6.20
Brass Special	6.20	....	6.20	6.20	6.25	6.25	6.25	6.25	6.225	6.225	6.25	6.25
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	65.75	....	64.50	64.50	63.875	63.625	63.375	63.50	63.75	64.00	64.625	64.25
Pig 99%	64.75	....	63.125	63.25	62.375	62.125	61.50	61.50	61.75	62.25	63.00	63.
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.	6.10	....	6.00	6.00	5.95	5.95	5.95	5.95	5.95	5.95	5.975	5.975
Aluminum c/lb. Duty 5c/lb.	26	....	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	....	35	35	35	35	35	35	35	35	35	35
Shot	36	....	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	....	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	12.	....	12.	12.	11.875	11.875	11.75	11.75	11.75	11.625	11.625	11.625
Silver c/oz. Troy Duty Free	56.25	....	56.125	56.125	56	56	56.125	56.25	56.125	56.125	56.25	56.50
Platinum $/oz. Troy Duty Free	66	....	66	66	66	66	66	66	66	66	66	66

	19	20	21	22	25	26	27	28	29	High	Low	Aver.
Copper (f. o. b. Ref) c/lb. Duty Free.												
Lake (Delivered)	12.875	12.875	13.	13.	13.125	13.125	13.125	13.125	13.25	13.25	12.625	12.863
Electrolytic	12.625	12.75	12.875	12.875	12.875	12.875	12.875	12.875	13.00	13.00	12.375	12.63
Casting	12.50	12.50	12.75	12.75	12.85	12.85	12.85	12.85	12.90	12.90	12.375	12.563
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.20	6.25	6.325	6.325	6.35	6.325	6.35	6.35	6.35	6.35	6.15	6.241
Brass Special	6.25	6.30	6.375	6.40	6.425	6.40	6.40	6.40	6.40	6.40	6.20	6.295
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	63.75	64.	64.	63.75	63.75	63.75	63.75	64.00	64.625	65.75	63.375	64.056
Pig 99%	62.25	62.25	62.50	62.25	62.50	62.50	62.50	62.75	63.375	64.75	61.50	63.081
Lead (f. o. b. St. L.) c/lb. Duty 2¼ c lb.	6.05	6.15	6.30	6.35	6.45	6.40	6.45	6.45	6.45	6.45	5.95	6.14
Aluminum c/lb. Duty 5c/ lb.	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	11.625	11.625	11.625	11.625	12.125	12.25	12.25	12.125	12.125	12.25	11.625	11.863
Silver c/oz. Troy Duty Free	56.75	56.75	56.625	56.50	56.75	56.625	56.625	56.25	56.375	56.75	56.125	56.356
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	66	66	66	66	66

* Holiday.

Metal Prices, August 8, 1927

NEW METALS

Copper: Lake, 13.50. Electrolytic, 13.25. Casting, 13.00.
Zinc: Prime Western, 6.35. Brass Special, 6.45.
Tin: Straits, 65.125. Pig, 99%, 64.125.
Lead: 6.55. Aluminum, 26.00. Antimony, 12.00.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $121.00. Bismuth, $1.85 to $2.00.
Cadmium, 60. Cobalt, 97%, $2.60. Silver, oz., Troy, 55.375.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¾to10¾
Brass Ingots, Red	11½to13
Bronze Ingots	12½to16
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	12 to16
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18 to22
Phosphor Copper, guaranteed, 10%	17 to21
Phosphor Tin, guaranteed 5%	75 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%.....according to quantity.....	28 to32

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12¾to13⅛
10¾to11¼	Copper Wire	12¼to12⅝
9¼to 9¾	Light Copper	10¾to11
9 to 9½	Heavy Machine Composition	10 to10¼
7½to 7¾	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8¼to 8¾	No. 1 Composition Turnings	9¾to10¼
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c. net base
From stock	22c. to 23c. net base

BARE COPPER WIRE

15¼c. to 15½c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. net base
100 lbs. to 200 lbs. in one order	21c. net base

ZINC SHEET

Duty sheet, 15% Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount ..... 10.00 net base
Casks, jobbers' price ..... 10.50 net base
Open Casks, jobbers' price ..... 10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finish Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57½c. to 59½c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect August 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¼	$0.19¾	$0.21¾
Wire	.18¾	.20¼	.22¼
Rod	.16	.20½	.22½
Brazed tubing	.26¾	....	.31½
Open seam tubing	.26¼	....	.31½
Angles and channels	.29¼	....	.34½

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅞c. to 24⅞c net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¼c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¼c. net base
Muntz or Yellow Metal Rod	16¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base) 35	Full Finished Sheets (base) 42
Cold Drawn Rods (base) 43	Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, August 8, 1927

ANODES

Copper: Cast	20c.	per lb.
Rolled	18⅞c.	per lb.
Electrolytic	19¾c.	per lb.
Brass: Cast	19c.	per lb.
Rolled	18⅞c.	per lb.
Zinc: Cast	13c.	per lb.

Nickel: 90-92%	45c. per lb.
95-97%	47c. per lb.
99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 59½c. to 61½c. Troy ounce, depending upon quantity purchase.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$28.30-29.60
14" 20 ply 64/68 Unbleached	35.90-36.80
12" 20 ply 80/92 Unbleached	31.25
14" 20 ply 80/92 Unbleached	42.40
12" 20 ply 84/92 Unbleached	36.00-41.90
14" 20 ply 84/92 Unbleached	48.80-56.10
12" 20 ply 80/84 Unbleached	37.15-38.20
14" 20 ply 80/84 Unbleached	50.40-51.45

Sewed Pieced Buffs, per lb., bleached 55-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11–.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.39
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.19-23½
Denatured, bbls.	gal.	.56
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.29
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05½
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Flour-spar (Calcic flouride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61

Iron, Sulphate (Copperas), bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17–.18
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.60
Nitrate, 100 ounce lots	oz.	.40½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.45½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	02½–.06
Zinc, Carbonate, bbls	lb.	.11–.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½